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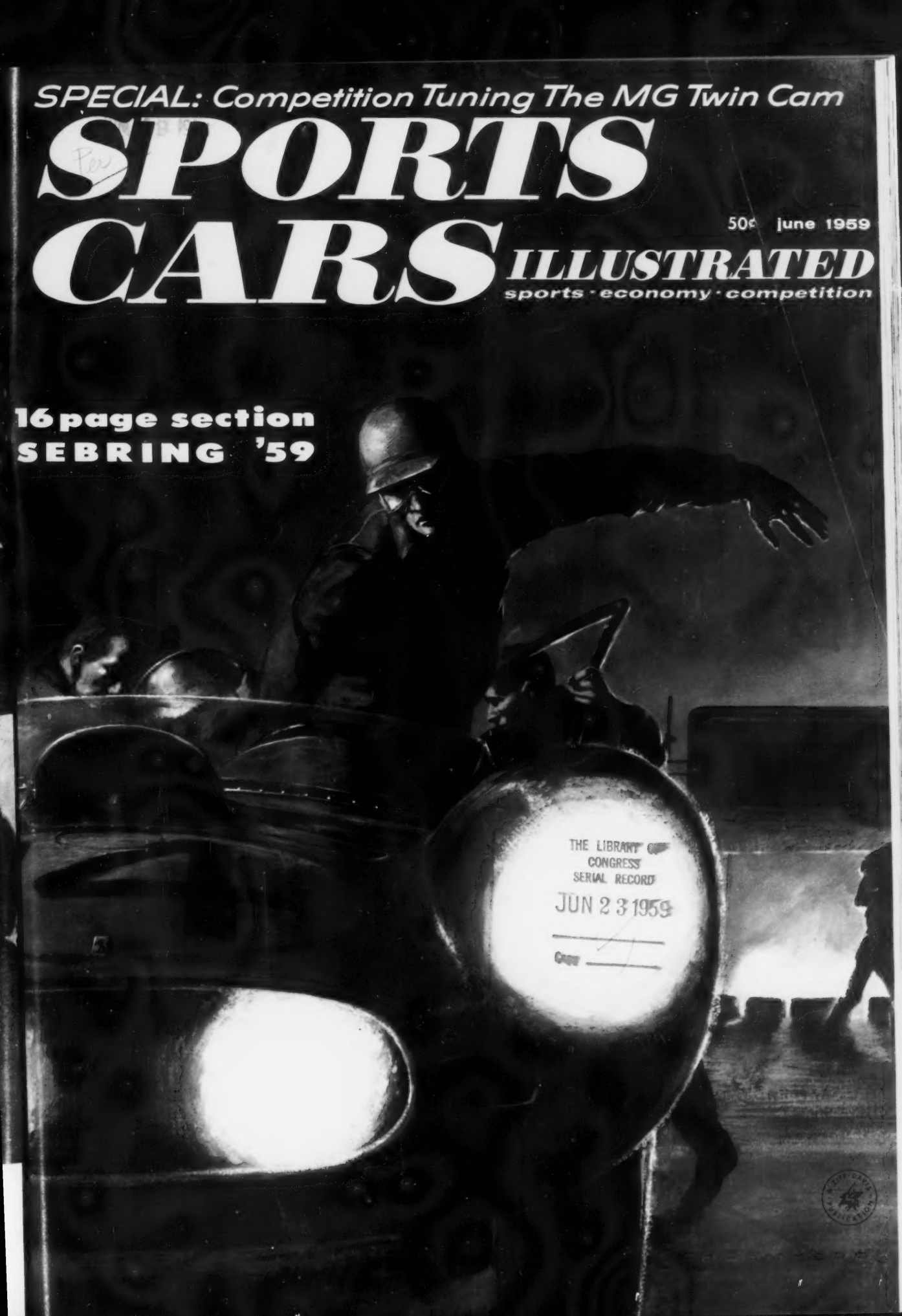

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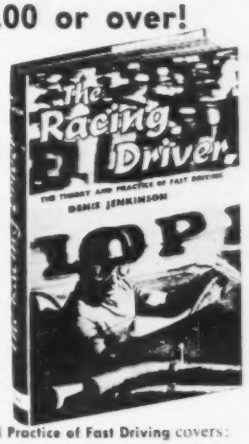

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SPORTS CARS ILLUSTRATED

june 1959
no. 12 vol. 5

A night pit stop at Sebring comes alive on this month's cover under the facile brush of artist Jack Schoenherr.

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HERE IT IS, Spring already — and with it another racing season. From the standpoint of sheer volume this is the biggest one yet. Judging from the schedules arriving daily at this desk there are as many as two race meets a week-end in some areas. From one point of view it might seem that the cow is being milked dry but such is not really the case. Most of these events are on the club or regional level, the number of major events remaining about the same.

What this means, of course, is that club racing has at long last come of age with more racing for everybody and — better still — racing for all levels of talent and ability both physical and financial.

To this end many of the clubs and SCCA regions have revised the racing classifications on a performance potential basis rather than on the basis of displacement alone. This was begun a year ago by the California Sports Car Club with great success both from the drivers' and spectators' points of view. Unfortunately few of the regions took it upon themselves to branch off from the very rational Cal Club judgements and the result in those regions is, to be charitable, chaotic. The danger of this system is that unfair grouping can result.

For instance one region in the East has the Alfa Romeo Veloce grouped with the Lancia Appia GT and Turner. The Appia is about a match for the Sprite which is one class down. In another class they have the AC Ace lumped with the far more powerful AC Bristol and the Porsche Carrera G.T. To illustrate how this works out, Porsche GT time around a certain eastern track is 1:13, Ace Bristol time is 1:16 and AC Ace time is around 1:20. All of which hands the class to the Carrera.

These inequities will probably work out in time but it does seem that the Cal Club's year of experience should be heeded and their grouping followed rather than an arbitrary grouping based on armchair reasoning.

With so many more races and so many more people racing, we felt that it was about time to implement our past contention that production cars must, to be successful at racing, first be made raceable. This is not to say that they must be hopped up but that they must be properly prepared over and beyond the mere addition of a roll bar and seat belts.

To this end we begin a series on preparing various production cars for competition *legally* with no hopping in the accepted sense of the term. We are not merely reporting on what others have done either; we are taking each car in turn and actually doing the work. First up is the MG Twin Cam which was prepared by Joe Virag whom readers will remember reworked a Sprite for us a few months back. Next will be the long neglected but potential-loaded Triumph TR3, followed by the Austin Healey 100-Six. These last two are undergoing treatment by Ed Brown who prepared this year's Sebring Morgan and who handled the tools on last year's Sebring Healeys and Dick Thompson's SCCA Championship Healey. Alfa Romeo and AC Bristol will follow these. In brief, we're sticking our necks out and actually putting the cars we'll be talking about into competition with their peers. One thing is sure, there'll be no grounds for protest — everything that is done will be public knowledge.

—john christy

"MAN, THAT WAS ONE OF THE HARDEST RING JOBS I EVER DID!"

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A word on cornering, the test of tire and driver

(with a footnote on broken glass)

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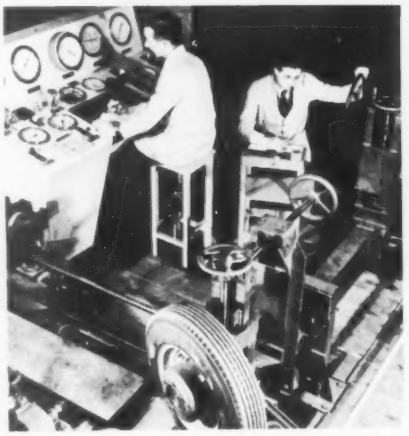

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letters

CHEV vs. . . .

With reference to Mr. John Christy's "Very Sincerely Yours" column, (March 1959) I should like to see facts and figures to back up the statement that "Chev powered equipment has taken on the best in the world and decisively beaten it *time and again.*" So far as I know Chev has not competed successfully in major European Grands Prix; the only standard on which a statement of this type can be based. Its efforts at Le Mans were hardly breathtaking but certainly showed improvement.

Martin W. Brown
New York, N.Y.

A fair example is Nassau, an international meeting during which nothing, not even a 5.9 liter Maserati V-8 could touch the Chev equipment. To our certain knowledge Chevrolet never competed at Le Mans, but in the U.S. Chev-powered cars mopped up the '58 season against any and all in their displacement class. As for Grand Prix, the Chev, 4.9 Ferrari, 3.8 Ferrari, 4.5 Maserati, and 3.8 Jaguar are all well over the displacement limit.

I've got to hand it to you; it was a stroke of genius commissioning Racer Brown to write a series on the Chev V-8. I would like to pose a question though. You imply in places in the March issue that the Chev, when properly modified, will compete with the 5.9 Maserati V-8 engine. I have seen several horsepower figures for this engine—all between 500 and 530 bhp. Does this indicate: (a) Maserati ponies are small, or (b) Americans can't tune Italian engines? I don't believe that a Chev will put out much over 400 bhp on gas, unblown.

Marshall D. Buck
Pasadena, Cal.

Italian horses have always proven a bit on the Shetland side when run on American dynamometers, particularly in the glamour categories though not usually in the smaller more common units. The basis for the conclusion is also by observation of the big Maserati, the Scarab and the Sadler on the same course under the same conditions.

WHOOPS

The fact that I am an enthusiastic Bugatiste led me naturally to your article "Knock Down The Wall, S'il Vous Plait" in your April issue of SCI.

On page 19, first column last paragraph Mr. Dreyfus and Mr. Purdy say, and I quote, "A Type 51 Grand Prix car was run out and warmed up and I began the tests." This statement I cannot dispute but the sketch on page 19 shows, I believe, a Type 35 and not a 51. If I am wrong may Ettore forgive me, and if you are wrong may he forgive you.

By the way how about some articles on some of the 'classic' classics like the 35 and the 35-c, etc. I enjoy your mag immensely and would like to see articles of this sort once in a while. Keep up the good work, you make life worth living.

Donald F. Kinsey
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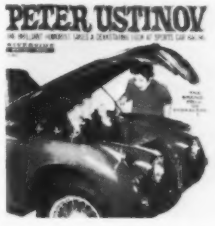

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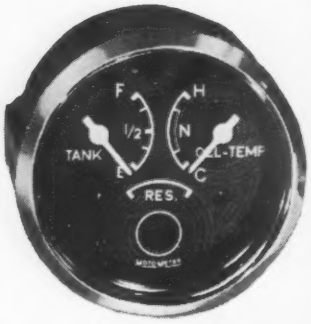

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technotes

FERRARI-CHEVY

I have just finished your fine "Chevy issue." It has turned out to be one of the finest issues to date. However, I have a few reservations which I would like to make known here.

The Chevy rockerbox is indeed a fine sports engine, with its ruggedness, versatility, and excellent power/displacement ratio, but it isn't, I believe, a good substitute for an OHC powerplant. In Mr. Robert Lee Behme's article about a Chevy-Ferrari combination, I observed that Mr. Behme apparently thinks that a stock touring Ferrari is a slow car. If he thinks this, I strongly urge him to take a ride in a strictly stock 250 GT, or even an older 212 Vignale. I am sure he will experience a change of mind.

Unless the 2.6 V-12 that was ousted was very tired indeed, I see no true reason for the switch. This is comparable to putting an Austin-Healey engine in a 750-cc Osca. Sure, you'd have more POWER, but the little giant isn't designed to receive such a "huge engine". The 2.6 Ferrari is admittedly no ball of fire, but it doesn't take a purist to see that every car can't, and shouldn't, be a fugitive from a drag strip. I think we all would be very sad indeed to see the Lotus, Osca, and other such firms drowned under a deluge of cars like Zborowski's 18-odd liter Chitty-Chitty-Bang-Bang II. Good things sometimes comes in little packages. . . . .

One more thing, by your leave — at the end of this article, a *Chevy* mechanic is quoted as saying, upon viewing the Ferrari-Chevy, "I'll be darned, have those foreign fellows finally come to their senses?" Come, now.

Malcolm Todd
Havana, Cuba

Well, well, we certainly stirred up a hornet's nest with our Chevy issue. This is one of the milder letters we received and is one of the few that can be answered. First of all, it should be made clear that the engine of the 2.6 Ferrari was very tired indeed. Secondly, it should come as no surprise to learn that Ferrari engine rebuilding can be very expensive. Thirdly, even though exquisite tuning of a 2600 cc V-12 may bring its rated horsepower up to that of a mild V-8 of nearly twice the inches, nothing but a big monstrous blower would do the same to the torque. Mr. Bok's installation gave him a fresh engine, full of pep, at low cost (well, relatively low) and with all the reliability a man could ask for.

Please notice that a V-12 was replaced with a V-8, not by an awkward to install in-line six or eight. Also note that the Chev is the lightest, smallest American V-8 available. Now if he'd put in a six or seven liter Lincoln or Buick engine, then I'd say it was all pretty ridiculous. On the other hand, if he could afford a brand-new 250 GT Ferrari (bored out to 3000 cc and hot-rodded now to put out 240 bhp instead of merely 170) the only thing he'd put in it is his foot.

As to your last point, we may not have a poet on the staff, but we know one and sometimes he lets us use his license.

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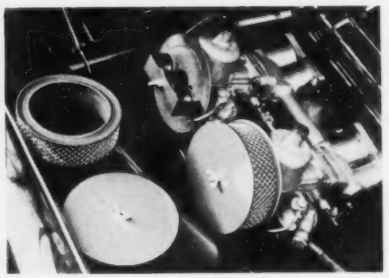
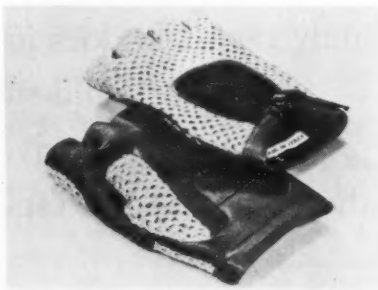


A thinking man's filter is being produced by Navigator Company, 4545 Elmwood Road, El Sobrante, California. Designed to replace the oiled gauze filters on S.U. carburetors, these units use standard dry paper filter elements that are cleaner and more efficient. In addition, the filters are fastened by wing nuts in front to allow easy removal for tuning. The units come ready for installation. There are models to fit all sizes of S.U. carbs, and range in price from $16.00 to $18.00 per pair, single filters are also available.

A sports car bag with a large capacity for all sorts of things is offered by Charmant Imports, Garden City 7, N. Y. Called, appropriately, the Sports Car Bag, it is 21-inches long, 8-inches wide, and 12½-inches high. The material used is water buffalo hide and is lined with sheepskin. All hardware is solid brass while the bag itself is brown with darker piping. Postpaid and tax included, $40.00.



A new addition to the Sala Sport glove line is the "Shortie". Made of supple Italian leather with double thickness palms, these gloves are crocheted in backless fingerless style for cool summer motoring. The strap has a snap fastener incorporated in the simulated buckle and is adjustable in length. Sizes 6½ to 10, plus extra small and extra large. Price $7.50 from Vilem B. Haan Inc., 10305-07 Santa Monica Blvd., West Los Angeles 25, Cal.

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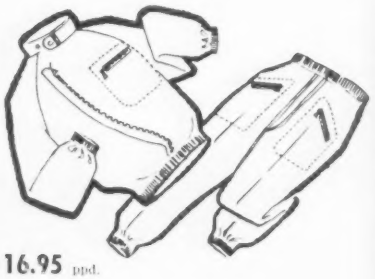

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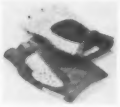

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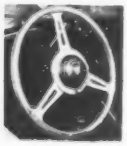

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Hard on the heels of the announcement early this spring of the cancellation of the 500 Miglia de Monza came a ray of hope that the "Race of Two Worlds" would not be knocked out after all — at least not completely.

Originally the sponsoring club, the A.C. of Italy, and Giuseppe Bacciagaluppi, Monza's promoter, had cancelled the race due to what they termed a "negative" attitude on the part of USAC in the matter of engine displacement. It was erroneously but widely reported that the Europeans wanted the displacement cut to 1500 cc but this was not the case. What was wanted was that the Americans hew to a limit of between three and 3.8 litres but nobody thought to ask the Americans about it. Instead they took the USAC announcement that the current USAC formula with its 4.2 litre limit was the final say and acted on that premise. Nobody was being hard-nosed — just hasty.

After a somewhat unofficial meeting in London, at least from USAC's point of view, on the proposed intercontinental formula, the 3-to-3.8 litre limit desire was made known. When informed of this, USAC president Tom Binford announced that he would poll U.S. car owners on the advisability of installing 220 Offenhausers in their cars for this event. He pointed out that this 3.6 litre engine is in common and plentful use as the standard power plant on USAC's sprint circuit and falls well within the proposed limitations. With favorable response, the 500 Miglia De Monza could be rescheduled for a fall date, possibly late September or early October. In the meantime the original 500 date has been rescheduled as a race for Grand Turismo cars of unlimited displacement. Anybody have a hot Corvette hardtop and some extra Monza rubber?

●

It has now become obvious that Aston-Martin will enter Formula I racing this year. Stirling Moss most probably will be number one driver with Masten Gregory and Roy Salvadori backing him up. Brooks's move to Modena is no surprise—really — for Tony has no desire to play second fiddle to any one in 1959 and if he were on the Aston squad things could have become difficult. We strongly suspect that Tony will limit himself to driving the Formula I Ferrari and not participate in any sports car competitions.

If the Cooper-BRM stays in one piece long enough for it to reach the Monaco starting line, Stirling Moss will be behind the wheel. Additionally, a large number of 1½ liter Borgward RS engines have been ordered by Cooper and the Bremen factory will concentrate on taking care of these demands and not race a team of factory 1500 cc sports cars this year. Borgward is expected, however, to make the latest type RS available to Stirling Moss if he wants it for several sports car com-

(Continued on page 18)

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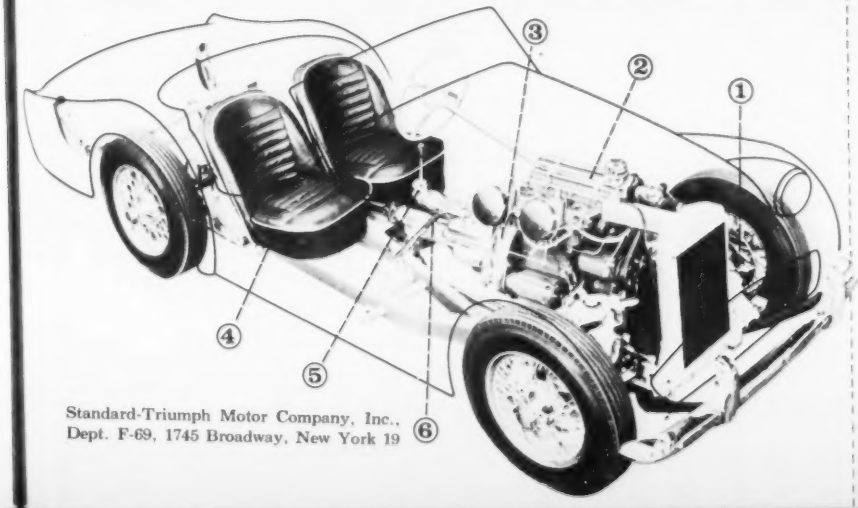

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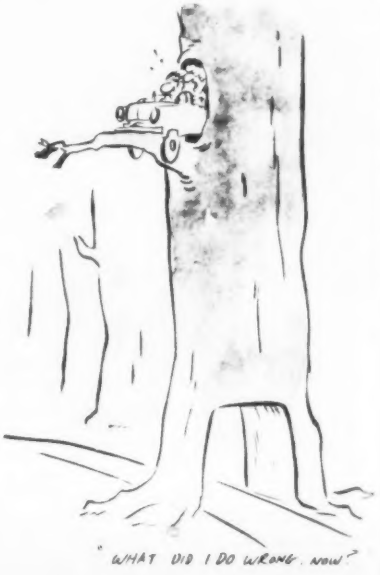
coming events

DATE and EVENT	LOCATION
May 10 Grand Prix of Monaco	Monaco
May 10 Grand Prix of Naples (sports cars)	Italy
May 15-16 Virginia Reel Rally Washington region SCCA	
May 15-16 Cumberland National Race Steel Cities Region SCCA	
May 16-17 Rally—New England SCCA	North Conway
May 16-17 Race—Drivers school Chicago Region SCCA	Wilmot
May 16-17 USAC Race	Marlboro, Md.
May 18 Grand Prix Crystal Palace (sports cars)	England
May 18 Grand Prix Mallory Park (sports cars)	England
May 18 12 hours of Hockenheim (sports and GT cars)	Germany
May 23-24 2nd Golden West Rally San Francisco SCCA	San Francisco
May 23-24 Sports Car Race New England SCCA	Thompson, Conn.
May 23-24 Forest Festival Race Northwest Region SCCA	Shelton
May 24 Targa Florio	Sicily
May 30-31 Sports Car Race New York SCCA	Bridgehampton, New York
May 30-31 Sports Car Race Kansas City SCCA	Coffeyville, Kansas
May 30 Indianapolis 500	Indianapolis, Ind.
May 30-31 CSCC Sports Car Race	Santa Barbara, California
May 31 G.P. of Holland	Holland
May 30-31 Mille Miglia Rally	Italy
June 6-7 Sports Car Race Atlanta SCCA	
June 7 Gymkhana Pan American SCCA	
June 7 Gymkhana Kansas City SCCA	
June 6-7 USAC Sports Car Race	Lime Rock, Conn.
June 5-7 Rallye du Monte Blanc- Iseran	France
June 7 F. Junior and 750 cc sports cars.	Castello-Teramo, Italy
June 7 1000 KM. Nurburgring	Germany
June 13 Photo Rally Northeast Michigan SCCA	
June 13-14 Mountain Rally Charleston SCCA	
June 13-14 Sports Car Race Savannah SCCA	Simons Island, Ga.
June 14 G.P. of Belgium	Belgium
June 14 Macon-Solutre Hillclimb	France
June 14-15 Adriatic Race	Yugoslavia
June 20-21 Sports Car Race Chicago SCCA	Elkhart Lake, Wisconsin
June 20-21 N.Y. National Rally Central N.Y. SCCA	New York
June 20-21 24 hours of Le Mans	Le Mans, France



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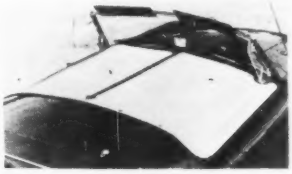

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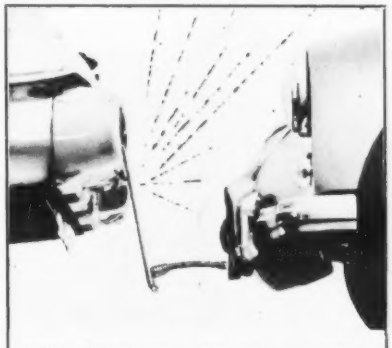

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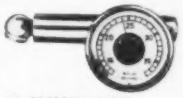

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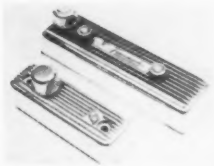

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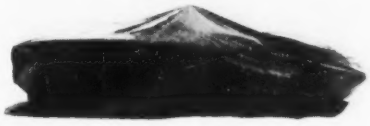

We've been telling people this for some time now and there are thousands of Mittens in use but we still see formerly beautiful sports and imported cars that obviously haven't been kept covered. Their tops are faded and rotten, leather cracked, chrome rusted, paint eroded and wood paneling checking . . . all traceable to the deleterious effects of weather. A Mitten tailored car cover will fend off sun, fog, grit and grime, not to mention bird droppings and other aerial pollutants. Mittens fold into small, easily-handled bundles and can be carried everywhere for your car's sake.

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(Continued from page 14)

petitions. The new Maserati 2-liter is nearing completion and it may be made available to Moss via BP, his sponsor. The Maserati Automobile factory has been purchased by Rheinstal AG, a Krupp subsidiary with interests that include desires to gain control of Munich's BMW factory.

Here then are the driver positions to date:

Ferrari	*BRM*	*Aston-Martin*
Brooks	Schell	Moss (most probably)
Hill	Bonnier	Gregory
Behra		Salvadori
Allison		
Gendebien		
Porsche	*Lotus*	*Cooper*
Von Trips	Graham Hill	Moss
Hermann		McLaren
Bonnier		
Barth		
Scarab		
Reventlow		
Daigh		

Looking for work: Georgio Scarlatti

●

The average 1959 model car (American) has 27 automotive lamps or five more than the average home uses for general illumination.

●

A fast growing track on the east coast is the one located at Vineland, New Jersey. A few events were run last year, but this year a full schedule of racing has been planned. Two drivers' schools, four regional SCCA races, and one SCCA national race are on the calendar. For further information write to Vineland Speedway Inc., 213 Quince Street, Vineland, N.J.

●

This prototype was seen during a road test near Bremen, Germany. It was unmarked, no details were available, but we strongly suspect it to be a Lloyd, Goliath, or Mercedes. *(?)*

●

A new two-liter sports car is to be raced this season by Maserati. Powered by an offset six-cylinder engine developing 200 bhp at 8,000 rpm, the car is based on the 250F G.P. machine and has a de Dion rear axle. Krupps, the German industrial empire, has acquired an interest in the firm.

●

A definite date has been set for the first international Grand Prix race to be held in this country. The Grand Prix of the United States will be held at Sebring Florida on December 12, 1959. Originally planned as a follow-up to the 12-hour sports car race, the G.P. was postponed due to a lack of entries.

●

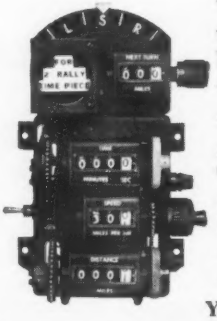
A new Fiat, known as the 1800/2100, will be introduced at the Geneva show. The designation 1800/2100 refers to the choice of displacement. Both engines are six-cylinder overhead-valve units with a 73.5 mm stroke. The 1795 cc engine has a 72 mm bore, while the 2054 cc engine has a bore of 77 mm. Horsepower ratings are 85 bhp and 95 bhp respectively. Maximum revs are about 6000, but the power is developed fully at about 5150. Compression ratio is 8.8 to 1.

The car has a fully synchronized four speed gearbox, independent front suspension with torsion bars, and a rigid rear axle with coil springs and leaf springs; the latter not intended as springs but more as radius rods to take braking and accelerating forces.

The engine has six intake and six exhaust ports covered by their respective manifolds, so it might not be long before certain Italian hop-up artists begin producing new manifolds and carburetor arrangements. As it stands, the stock machine is in the 90 mph class.

●

IT'S EASY TO GET LOST IN A RALLY



You're so busy watching the road, checking the tables, and punching the time piece, that it wouldn't be too surprising if you ended up in another county – or even in another country!

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- It simplifies average speed changes, eliminates zeroing odometer and time pieces – no requirement to stop.
- It's accurate – zero error at 30 MPH.
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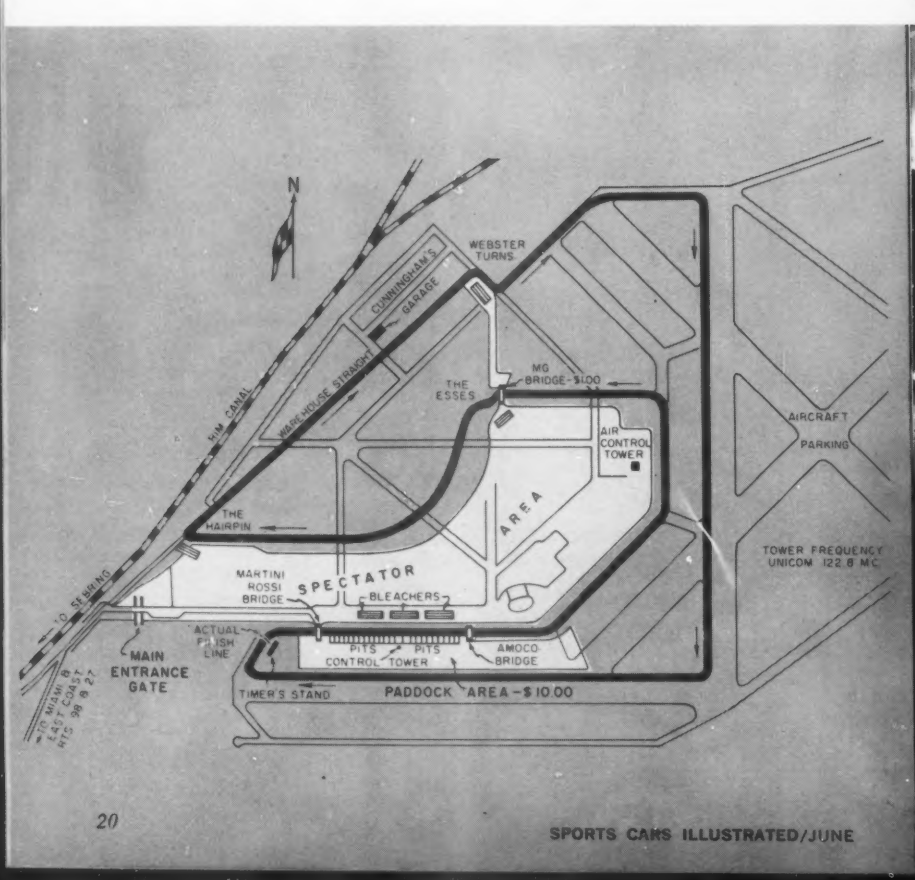


Left New York on Saturday afternoon a week before race day. Trip south was uneventful. Noticed a few things going the same way; cars, vans, trailers, etc. More as we neared Sebring. Stopped in Fayetteville Sunday afternoon to watch local drag races. Quarter mile blacktop, dirt field for shutting down. Police-type timer for speed clocking at end of strip. Almost matched the Lark against a Dauphine. Not enough odds. The boys have a lot of enthusiasm. Dirt at start made for impressive wheel-spin. Looks good anyway.

Rain started by the time we reached Georgia. Didn't stop until we left Georgia . . . going north. Great. Stuckey's, Horne's, Horne's. Jacksonville radio station well trained by Florida Chamber of Commerce. Would not admit that it was raining. "Mostly fair, partly cloudy." Couldn't see through windshield. Horne's, Horne's, Stuckey's, Horne's.

No trouble with southern lawmen . . . except Tuesday. Had an almost in Lake Wales. All we wanted to do was to break a lightbulb. Locals illuminate signs without regard for oncoming drivers. Very discouraging. So was John Law. Arrived Kenilworth Lodge 1:00 AM. Checked in, dried off, hit sack. More rain. Wild animal farms. See the swimming elephants. More Stuckey's, more Horne's, more rain . . . still.

Ventured out on Tuesday to look in garages. Not too many cars in evidence. Mud all over. Puddles. Rain. Biggest talk was about the Lotus cars. They were still on the ocean. . . . probably drier than we were at this point. Would they make it in time for practice on Wednesday? Would there BE practice on Wednesday?

Wednesday. Rain. Went to track to see what was going on. A few brave souls were practicing pit stops. Three inches of water in the pits. Practice officially postponed. Went back to garages, nobody there. EVERYONE was looking for rainwear. All stores sold out. Plastic material was sold by the yard for wrapping around feet. Crazy footprints. Stores in sunny Florida not stocked with rainwear. Ha.

Wednesday night was quiet. No practice during the day—no mechanical failures—nothing to check—ergo, no work. Drip, drip, drip.

Thursday dawned bright and wet. Still raining. Practice held anyway. Track ideal for boat races. Is Sebring the lowest point in Florida? Nobody went fast. No reason to. Couldn't check tire wear, fuel consumption, nothing. FIA regulation tops were not erected. Wonder why? Just goes to show how silly some rules can be. Lotuses finally arrived at Miami. Still on boat. Night practice postponed.

Friday. No rain! Cloudy, track still wet. Practice a bit more interesting. Vintage car parade run on schedule. Practice lasted only a couple of hours. Some cars left at track for night practice, rest driven back to garages. Strange sight to see Ferra , Porsches, and the rest being driven through streets. What's that about dual purpose sports cars? Night practice rather short. Big flurry when Loti arrived. Two Elites and two Elevens. Elites very pretty. Cooper Monaco showed up at garages around midnight. Did not practice. Car came with modification instructions, no modification. Oil tank leaked on right hand turns. Too late to relocate breather tube. Many cars did not practice at night. Porsche and Ferrari adjusted lights in garage area, not at track. Just as well. Much late night work before race. Last minute practice is not ideal. Nobody knew about tires and gas . . . play it by ear on race day and hope you can schedule the pit stops correctly.

Race day was clear. There really is a sun. Ulmann's ninth year of lucking out just in time. . . . Usual madhouse before the start. High school band, Miss Sebring, excited mechanics, confused police, harried photographers, Alec Ulmann speaking French. . . . quite a carnival, but is it a motor race?

A few minutes before 10:00 A.M. things looked more like a motor race. Cars on one side, drivers on the other. Quiet. The countdown. Drivers run to cars . . . one of them is minus a crash helmet . . . slight pause . . . noise, smoke, excitement, the start. . . .

Without a doubt, this is the climatic moment of Sebring. All that follows is denouement as the players act out their parts, drivers, mechanics, and officials alike.

But to these participants and to the many spectators who try to keep track by listening to the PA system or keeping their own lap chart, there are twelve full hours ahead.

Though he led on the first lap, at hour's end Salvadori's initial spurt had withered to an outpaced eleventh spot. Ahead of him, in order, were three Ferraris (Behra-9, Gurney-7, Gendebien-8), one Lister (Bueb-2), Gendebien-8, then Bueb (Lister-2), von Trips (Porsche 31), Hansgen (Lister-3), three more Porsches (Mieres-36, Sessler-34, Fitch-32) and Pedro Rodriguez (Ferrari-11).

By noon, Gendebien had passed Gurney, von Trips had gotten past Bueb, and Mieres had dropped back to tenth. Already out for good was the GT Aston-Martin with a burnt piston.

At twelve-thirty or so there were a flurry of pit stops among the leaders, all hoping to do the race in four stages. Behra-Allison had already lost the lead in a nearly six minute halt, dropping to fifth when the starter switch balked. Leading was Gendebien, 26 seconds behind was Gurney. Both Ferraris were due to stop before 1:00 PM. Third, and sitting in the pits at the half-hour was the von Trips-Bonnier Porsche. Forty-five seconds behind them came Bueb, stopping to hand the streamlined Lister over to Moss. He left the pits only 19 seconds behind Bonnier. Sesslar had handed over quickly to Holbert a lap earlier in Porsche-34. In the next 30 minutes, Holbert, Moss and Allison passed the harassed Bonnier (who seemed not so anxious to lift the inside front wheel on turns as had von Trips). With the Ferrari driver changes, the one o'clock order was Hill (8), Daigh (7), Allison (9) followed by Moss (2), Holbert (34), Bonnier (31), and Barth (32). Moss didn't like being the Lister filling in a Ferrari-Porsche sandwich and pressed on with consumate skill.

By two o'clock, what he had gained could be measured only with a stop-watch and not by looking at the leader board, which hadn't changed. But at two-thirty, the rear axle of Hill's Ferrari Testa Rossa packed up and the car was out. Perhaps demoralized, the remaining two Scuderia Ferrari cars let Moss by into first place just in time to make the three o'clock notices read Lister-2, Ferrari-7, Ferrari-9, Porsche-31, Porsche-34, Porsche-32, Porsche-37, Ferrari-12 etc.

Out of the sandwich and into the soup. At 3:50, Moss' Lister halted on the course, apparently out of Amoco. Stirling's fatal flaw was to accept a Lambretta ride to the pits (the rules say "on foot"). The Lister wasn't out of gas, he didn't break the seals on the tank, and after he restarted, otherwise unaided, he ran half a dozen laps while the stewards pondered. Their decision was that the car was out but that Moss and Bueb themselves were still in and could drive one of the other Listers if Briggs Cunningham so desired. Technically, the #2 Lister was entered by Brian Lister, but like many other annoying details, this was carefully overlooked.

In a similar move Hill (and later Gendebien) had replaced Gurney and Daigh in Ferrari-7 just after 3:00 P.M. The five minute pit stop involved let the Behra-Allison car by into first and the von Trips-Bonnier Porsche-31 moved into second. Holbert-Sesslar in Porsche-34 held grimly to four place with a mere ½-second lead over the Barth-Fitch car of 90 more cubic centimeters.

Behind the wheel once more, Hill started catching the pesky Porsche by some seven seconds per lap and his teammates in first place at about half that rate. At four-thirty, the Sunshine State let everyone have it again, just to show what practice had really been for. Everyone's lap times increased abruptly but Hill continued his relentless attack. By five o'clock he was well past the Porsche and but 16 seconds behind Behra who was about to hand over to Allison. The latter was very unhappy about the motorboat race he found himself in, pitting once to see if the steering had gone awry. (It hadn't.)

Stirling Moss had taken over the Lister-4, Cunningham hoping that Moss' uncanny ability in the rain would enable him to make some progress. Impressive as his driv-

Car No. 31 with new Porsche experimental double-wishbone rear suspension would go through corner lifting inside front wheel as much as five inches off the ground for a distance of twenty-five feet, while normally suspended No. 32 went through flatter and slower. von Trips (left) looks very comfortable in the newer works P-Wagon. In the rain (below) all the Porsches seemed to throw spray ahead as well as up and to the rear.

ing was in these impossible conditions, he was too far behind and the old car just didn't have it.

Shortly before sunset, the rains dwindled, ceased, and, as if to make up for all the suffering, a double rainbow arched from one horizon to the other. Drying the track as they went, the 51 remaining cars raced for the pots of gold.

From then on, it was only a matter of sticking it out. The top ten remained fixed from eight PM on other than some swapping of positions as the McAfee-Miles Porsche-35 surged ahead of the E. D. Martin-Reventlow and Johnson-Lunken Ferraris, only to be passed again in a five minute pit stop in the last hour.

During these hours of darkness, the visual excitement was limited to watching the luminescence of various brake discs near the hairpin.

But if Behra's brakes grew red-hot, the battle for Index of Performance was at white heat for the final four hours. For simplicity, the Index is worked out on the basis of fully completed laps only (no fractions). Thus the hourly reports are apt to be pessimistic for those who were just short of finishing a lap as the hour ends. As for figuring them yourself, well, most people just wait for Joe Lane, the Chief Scorer and Timer, to work the figures out and we don't blame them one bit.

Until the rains came, the expertly piloted Holbert-Sesslar 1498 cc Porsche-34 had kept as firm a grip as the mathematical intracacies and the opposition would allow. But it did rain, and by six PM, they had dipped decimally behind two 750 cc machines, the deTomaso-deTomaso-McCluggage Osca and the factory-entered D. B. driven by Messieurs Armagnac and Laureau, two Frenchmen who live in Paris. By eight PM, the Osca had in turn dropped back, having ceded four laps in two hours to the front-drive, air-cooled buzzer which churned through the wet like a paddle boat. Since the Ricardo Rodriguez-Kessler Osca was stuck in the mud (literally), the youngest of the Mexican brothers was recruited to the private deTomaso entry — with official permission despite rules which say otherwise. Driving like a demon, he brough the slim Osca up within ninety seconds of the D.B. Since their displacements are identical, this only gained them second. Third was the twice-as-large Holbert-Sesslar Porsche entered by Cyrus Fulton, which only just nudged out the 1588 cc factory car driven by von Trips and Bonnier. The pertinent figures are, respectively, 1.3613508, 1.3529474, 1.3382278 and 1.3333376. This degree of accuracy seems a bit out of place. Like the dry lakes, ten years ago. Now who would have guessed that Sebring this year was anything at all like a dry lake meet?

And then at ten PM, the cannon booms and the race grinds slowly to a halt. Forty-seven cars finish officially in the next ten minutes. Long before then the spectators have overwhelmed the snow fence and charged across the pit area straight to surround the cars and mob the drivers and crewmen. No serious effort is made to stop them, to do so would reduce the dramatic effect as the crowds mill about the winners. There are no goal posts, but the advertising banners and the overhead pit signs and emblems are quick to go.

Down at the Timing Stand, the madhouse was in full swing as the teletype to Control HQ clicked away, giving results for press and radio. The first twenty plus class winners plus handicap figures on the top three. Questions. Answers. Figures and more figures. Names, makes, displacements, laps completed, home addresses, reasons for stopping.

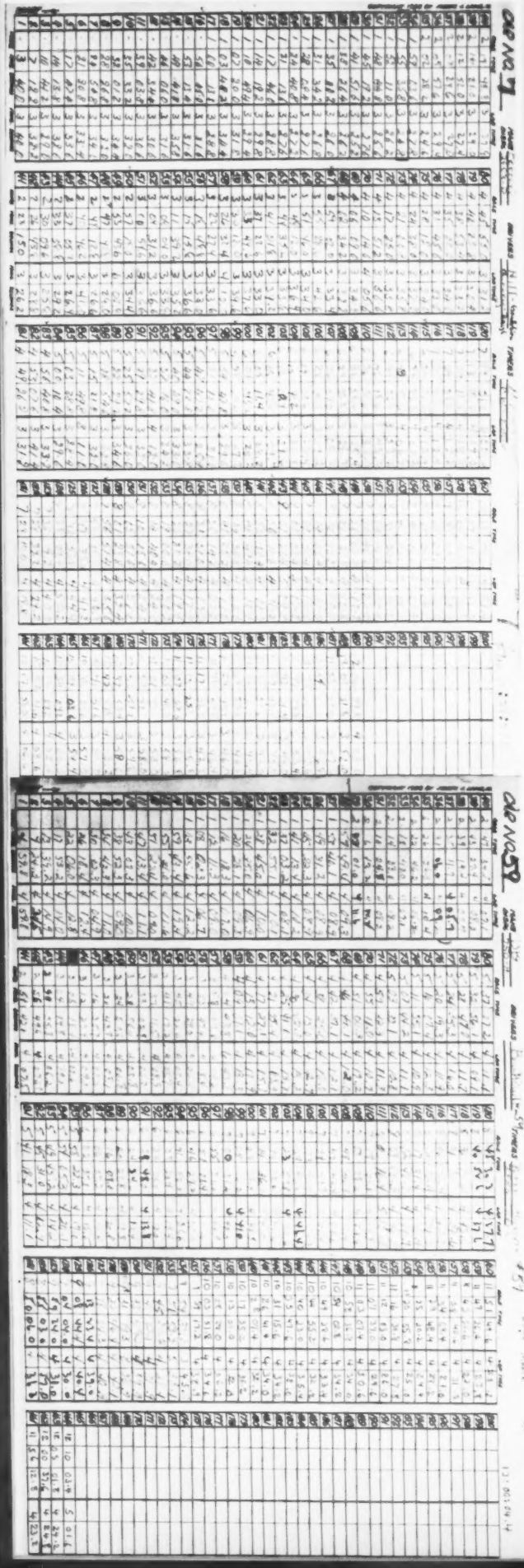
Tired, and laughing at things that weren't all that funny, and glad that it's over at last, we joined the next endurance grind —the one back into Sebring itself. Also in this parade were the three factory Ferraris, even the non-finisher #8. Apparently they made the trip successfully, though the Hill-Gendebien-Gurney-Daigh car had a rough time of it in Victory Lane. Tavoni will have an interesting time explaining to Enzo how come it's missing its enamel nameplate, the oil filler door in the hood, the oil filler cap itself, the rear-view mirror, the gear shift knob, the fire extinguisher *and* the spare tire and wheel. What price Championship points?

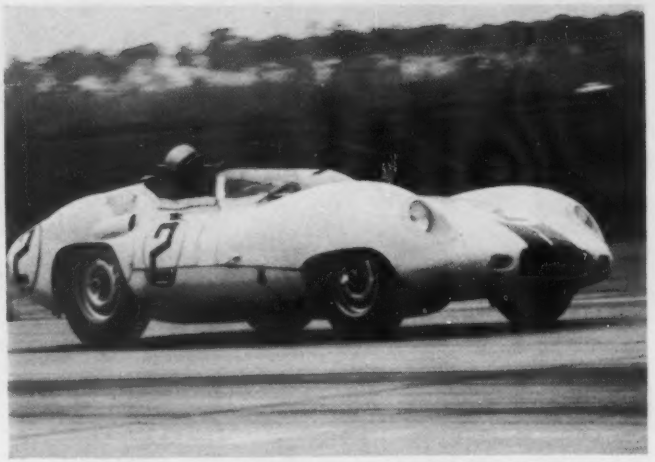
(Continued on page 80)

French ballet could be watched, and enjoyed, at every D.B. pit stop. Index winner made three pit stops—for total time of 11½ minutes, which proves that fancy foot-work pays. Car (below) was pretty fast on the circuit too.

Red Byron's boys took pit stop practice seriously, even though they had to tread water some of the time.

Jean Behra (above) cut fastest lap—3:21.6—of entire race in mate to winning car (left).





Nobody likes to be a DNF, but pity poor Bueb (above). His teammate, Stirling Moss, was leading the race when the Lister ran out of gas, leading eventually to their disqualification.

Results—Florida Grand Prix of Endurance, March 21, 1959

Overall Position	Car #	Laps	Make	Displacement	Drivers	Class Position	Best Lap
1	7	188	Ferrari	2953	Hill, Gendebien, Gurney, Daigh	D-1	3:24.8
2	9	187	Ferrari	2953	Behra, Allison	D-2	3:21.6
3	31	184	Porsche	1587	Bonnier, VonTrips	E-1	3:27.0
4	34	182	Porsche	1498	Holbert, Sessler	F-1	3:29.6
5	32	181	Porsche	1498	Barth, Fitch	F-2	3:29.3
6	12	174	Ferrari	2953	Martin, Reventlow	D-3	3:33.5
7	14	174	Ferrari	2953	Johnson, Lunken, Andrey	D-4	3:38.8
8	35	173	Porsche	1498	Miles, McAfee	F-3	3:28.0
9	70	171	*California*	2953	Ginther, Hively	gt9-1	3:47.2
10	37	170	Porsche	1498	Erickson, Hugus	F-4	3:33.2
11	33	164	*Carrera*	1598	von Hanstein, deBeaufort	E-2, gt6-1	3:56.8
12	3	164	Lister	2986	Hansgan, Thompson	D-5	3:30.9
13	19	164	Ferrari	1994	Casner, Hunt	E-3	3:46.2
14	25	164	A.C.	1971	Jackson-Moore, Cook, Burns	gt7-1	4:00.4
15	4	164	Lister	2986	Cunningham, Boss, Moss, Underwood	D-6	3:30.2
16	44	162	Alfa-Romeo	1390	Kaplan, Rainville	gt5-1	4:03.8
17	59	162	D.B.	750	Armagnac, Laureau	H-1	4:03.6
18	60	161	OSCA	750	de Tomaso, de Tomaso, McCluggage, R. Rodriguez	H-2	3:59.0
19	48	160	Elva IV	1096	Baptista, Tweedale, Wallace	G-1	3:54.2
20	15	160	Ferrari	2953	Gomez-Mena, Fernandez	gt9-2	3:50.0
21	45	160	*Elite*	1216	Chapman, Lovely Chamberlain	gt5-2	4:03.0
22	24	159	AC	1971	Means, Wees, Kurtz	gt7-2	3:58.6
23	49	158	Elva IV	1096	Jordan, Dietrich	G-2	3:52.3
24	23	158	AC	1971	Rix, Rahal	gt7-3	4:03.0
25	26	155	Arnolt	1971	Arnolt, Durbin, Goldman	gt7-4	4:06.4
26	22	155	Morgan	1991	McNiell, Rothschild	gt7-5	4:10.6
27	28	155	MGA	1588	Ehrman, Seidel	gt6-2	4:10.2
28	64	152	Fiat-Abarth	750	Rutan, Cuomo, Richards	H-3, gt3-1	4:18.3
29	62	150	Fiat-Abarth	750	Cattrici, Cussino, Avidano	gt3-2	4:19.8
30	65	149	Fiat-Abarth	750	Schrafft, Jeffords, Kuhn	gt3-3	4:21.8
31	54	149	*Sprite*	950	Sutherland, Stiles	G-3, gt4-1	4:26.4
32	63	147	Fiat-Abarth	750	Potronieri, Thiele, Norwood	gt3-4	4:19.2
33	40	145	Lotus	1475	Moran, Rand	F-5	3:57.0
34	29	145	MGA	1488	Parkinson, Dalton	gt6-3	4:04.2
35	51	144	Lancia	1090	Blanchard, Callanan	gt5-3	4:33.6
36	53	142	*Sprite*	950	Leavens, Kunz	gt4-2	4:21.7
37	58	141	D.B.	750	Wood, Perrier	H-7	4:01.0
38	55	141	*Sprite*	950	Hayes, Christy, Colgate	gt4-3	4:25.3
39	43	140	Alfa-Romeo	1390	Comito, Kramarsky, Pfaff, O'Brien	gt5-4	4:07.8
40	52	140	Lancia	1090	Baumberger, Rohlfs, Cronkite	gt5-5	4:39.0
41	18	138	Maserati	1998	Hall, Sharp	E-4	3:37.8
42	42	134	Alfa-Romeo	1290	Grossman, Rubin	gt5-6	4:06.2
DNF	10	130	Ferrari	2953	Geitner, Carveth	Collision	3:34.4
DNF	21	128	Triumph	1991	Kolb, Hobbs, Moore	Valve	4:22.0
43	80	128	Turner	950	Lieb, Drolet	gt4-4	4:43.2
DNF	27	126	Lotus XV	1965	Entwistle, Hanna	Electrical	3:32.4
44	47	123	Lotus XI	1096	Fleming, Schade, Dager	G-9 Head gasket	3:50.0
45	30	121	MGA	1588	Pickering, Flaherty, Decker	gt-6 Holed piston	4:03.6
DNF	38	115	Osca	1491	Campbell, Haas, Middleon	Off course/ Ignition	3:43.9
46	16	110	*Berlinetta*	2953	Arents, Reed, O'Dell	gt9-3 Rear axle	3:49.0
DNF	56	115	Osca	954	Rodriguez, Kessler	Retired on course	3:45.0
DNF	2	99	Lister	2986	Moss, Bueb	Disqualified	3:23.6
47	20	98	Triumph	1991	Bentley, Samm	gt7-6	4:17.4
DNF	66	97	Stanguellini	748	MacArthur, Rollason	Crashed at M-R Br.	4:14.8
DNF	57	82	D. B.	850	Hanna, Toland	Engine failure	4:16.6
DNF	61	82	Osca	749	Publicker, Makins	Broken spark plug	4:07.8
DNF	8	77	Ferrari	2953	Hill, Gendebien	Final drive failure	3:21.8
DNF	11	66	Ferrari	2953	Rodriguez, O'Shea	Engine failure	3:30.4
DNF	46	65	*Elite*	1216	Chamberlain, Weiss	Engine failure	4:02.0
DNF	36	34	Porsche	1498	von Dory, Miery	Camshaft failure	3:30.0
DNF	50	34	Elva IV	1086	Wyllie, Lang, Wyllie	Suspension damage	3:46.0
DNF	1	32	Aston-DB[illegible]1	2992	Salvadori, Shelby	Clutch	3:38.0
DNF	41	31	Alfa-Romeo	1290	van Beuren, Valesquez, Mercader	Overturned in esses	4:35.2
DNF	39	20	Cooper	1476	Lucas	Lost its oil	3:46.1
DNF	17	11	Aston-DB2/4	2992	Shepherd, Furlong, Schiff	Piston failure	4:40.6

By John Christy

Super Sprites at Sebring

PROBABLY the most frequent question heard after the Sprites' first outing in the rain was: "What's in them? The more usual "Wot'll she do" type of quiz had already been abundantly answered.

Quite obviously they are not showroom models. The first things that meet the eye are the 13-inch wire wheels, steel-rimmed, 58-spoke Dunlop units built especially for the Healey concern and soon to be made an optional item. At first glance the hubs seem the same as those on the MGA, Triumph, large Healey and so on but they aren't. They are the same diameter but the spline section is about half-an-inch shorter. These hubs are backed up by Dunlop disc brakes on all four wheels. It was this last item that, coupled with fairly light weight, allowed the Sprites to dive so deeply into the turns. The brakes were absolutely amazing, showing no fade and only minor pedal loss throughout the entire twelve hours.

The wheels as yet have no part number but the number of the brake kit is part #Q.2337.

The suspension front and rear was stiffened with optional competition springs #Q.2334 and 2335 respectively. Additionally, a torsion anti-roll bar, part #Q.2315 was used on the front end. Damping was by standard shocks with different valves.

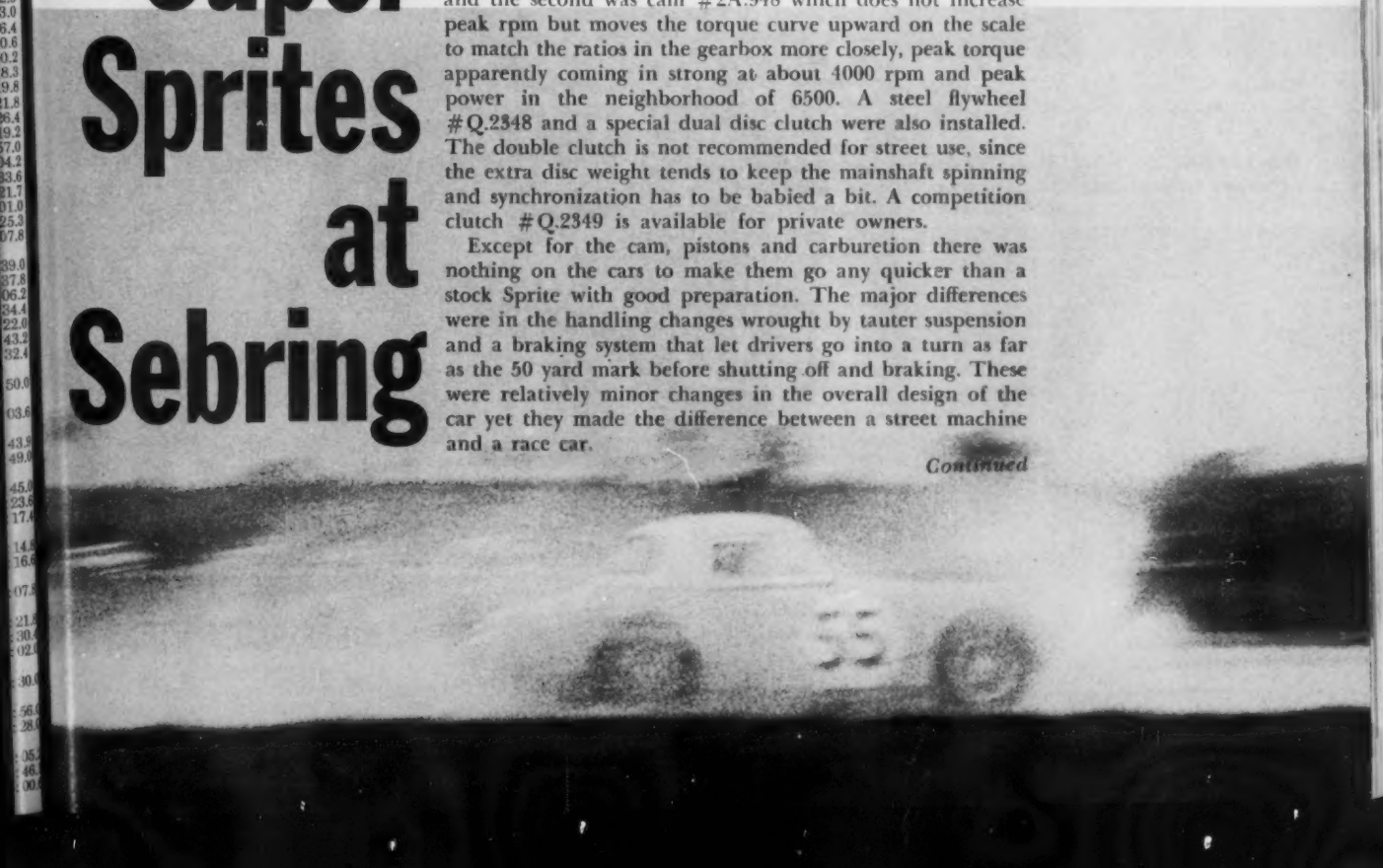
Gearing was also an optional set-up with the close ratio gearbox, #Q.2354 carrying ratios of 3:1, 1.99:1, 1.35:1 and 1:1 for first, second, third and fourth gears. The rear end carried the 4.55 to 1 ring and pinion.

The engines were given the standard factory competition treatment. The head is reworked in similar fashion to the one described in our December 1958 and January 1959 issues. It can be matched as described therein or a factory unit #Q.2302 can be ordered. It was equipped with 1¼-inch S.U. carburetors and special manifold #Q.2344 on the intakes. The exhaust carried a special tuned header system with the two outside ports connected in a Y and thence carried to the rear. The center exhaust port carried its own pipe separately to the rear, the whole forming a dual pipe system.

Inside the block proper, except for a superb balance job, only two changes were made, also listed options. First was a set of pistons, #2A.946 with flat, instead of concave, tops and the second was cam #2A.948 which does not increase peak rpm but moves the torque curve upward on the scale to match the ratios in the gearbox more closely, peak torque apparently coming in strong at about 4000 rpm and peak power in the neighborhood of 6500. A steel flywheel #Q.2348 and a special dual disc clutch were also installed. The double clutch is not recommended for street use, since the extra disc weight tends to keep the mainshaft spinning and synchronization has to be babied a bit. A competition clutch #Q.2349 is available for private owners.

Except for the cam, pistons and carburetion there was nothing on the cars to make them go any quicker than a stock Sprite with good preparation. The major differences were in the handling changes wrought by tauter suspension and a braking system that let drivers go into a turn as far as the 50 yard mark before shutting off and braking. These were relatively minor changes in the overall design of the car yet they made the difference between a street machine and a race car.

Continued



With identification light atwinkle, lonely Sprite steams by on soggy circuit.

Marcus Chambers, Sprite Team Manager (second left) runs through race strategy with his drivers.

THIS PARTICULAR story of Sebring really begins some six years ago and about 2800 miles from the Florida Highlands.

In the summer of 1953, a short, stocky Englishman with a perpetual twinkle in his eye, accompanied by an assorted crew of mechanics arrived on the flat sea of pure white salt that is the Bonneville Speedway. With him was a businesslike little roadster painted a rather hideous shade of dull green. The object was to set records and set them they did — by the hatful. Thus was introduced the Austin Healey to Americans and thus was introduced Donald Healey to the author, beginning a friendship that has continued in a series of sporadic meetings at one motoring function or another. The most recent was Speed Week at Nassau.

Over luncheon in the warm Bahamas sun the talk got around to the latest Healey brainchild, the Sprite. Then came the jolt. Two jolts, actually.

"We're entering Sprites this year at Sebring. How would you like to drive one?"

It was only after the surprise of the first sentence, surprise at the audacity of entering the tiny Sprite in that manufacturers' merry-go-round, that the tag-line question sunk in.

Would I like to drive a factory team car at Sebring? Do wheels turn, is Alaska big? Hell, yes, I'd like to drive at Sebring.

Donald went on to tell about the planned entry. There would be four Sprites, one on reserve. No Hundred-Sixes. The first car was already undergoing test under the direction of Donald's big guardee-mustached son, Geoffrey.

"It's a bit warmed up, of course," he said. "Disc brakes, wire wheels and that sort of thing. It'll break a hundred I should expect."

Having been familiar with the speaker's speed efforts over the past six years, I was prepared to believe that these would be very adequate little automobiles indeed. Then the willies set in. First, would I be able to do two jobs adequately — to pay attention to the task of driving and at the same time pay attention to the bread-and-butter work of covering the race.

Another thing: Sebring is a race in which the fiercest machinery in the world, and the smallest, compete on the same course at the same time. The Sprites fell into the latter category. It's a creepy feeling to know that someone, the likes of Stirling Moss or Phil Hill, is at one point or another on every lap going to boom by you at some 70 miles faster than you're going, flat out and with foot firmly bolted to the firewall. Creepy.

A few weeks later, after all this had time to sink in came a letter asking confirmation. I confirmed and in return got a letter officially appointing me to a seat on the team, the car and driver position, first or second to be assigned later. Go get an FIA license, said the letter.

Followed months of somewhat nervous anticipation and finally the sixteenth of March rolled around. The check-in at race headquarters and ensuing physicals were a breeze.

The team was garaged in the town of Avon Park, just far enough away from the hectic pace at Sebring to allow some peace and quiet. There, in a large service station garage were four of the happiest yet most capable looking little blue roadsters I've yet seen, aswarm with busy mechanics working on last minute details under the direction of Geoffrey Healey.

The drivers, seven of us; Ed Leavens, Phil Stiles, "Doc" Kunz, Fred Hayes, Hugh Sutherland, John Colgate and myself, were taken in tow by Marcus Chambers the team manager. Marcus, a large, rounding, sandy-haired man whose spectacles are forever sliding down his nose in such a way that most of his glances are sent over the top of the rims, got right down to cases. We were told how high we could rev, what the signals meant and then he asked for questions. They came thick and fast from all sides. Each question was answered carefully until all angles were covered. How fast would we come in to the pits? Not at all fast — haste makes waste. Would we kill the engines by stalling with the clutch? Yes, to prevent any tendency to run-on. We'd park with brakes off, and out of gear. We'd be given our lap times by signal board and told either to speed up, hold position or slow down as the case demanded.

"Just so you don't feel alone we'll be chatting with you by signals from time to time." Very reassuring — it gets lonesome on five-odd miles of concrete if nobody pays attention to you.

Then we were formally introduced to the cars. Each driver got in and squirmed around, pushing pedals, wiggling gear-levers and trying the seatbelts. Hayes and I were assigned to Number 55 with Johnnie Colgate assigned as reserve and/or third driver. The mechanic on the car, Brian Griffin from Canada, listened as we requested minor adjustments, then made a few suggestions himself.

Thus were we and the Sprites fitted to each other.

And all this while it rained. And rained. And *rained*.

The next day — the first day of practice — dawned the same. Wet. The entire land seemed to be a dismal sea of puddles. The course was as wet as any racing plant can get. Where there wasn't standing water there was running water coming from some place else. It was probably the worst set of conditions possible to make acquaintance with an automobile one was expected to drive some hours at full noise.

Doctor Kunz, Phil Stiles, Fred Hayes and John Colgate started. Instructions were to take three laps at 5500 revs maximum then bring the cars in for plug checks. Then back out for another five laps to round out an hour. The stop was also a pit rehearsal with the driver hauling himself out of the car and over the pit wall as quickly as possible so the allowed three men (two mechanics and a fuel man) could get to work. The stops came off like clockwork — no worry here unless someone (the most likely one would be me, I thought) got excited and goofed.

The first job of an incoming driver was to report immediately to Geoff Healey. Any odd noises, car misbehavior or problems were to be reported first. Then and only then was the incoming man to brief the next driver.

"How was it," I asked Hayes on his plug check stop with #55.

"Wet," said Hayes succinctly. "The car goes beautifully, though. It's pretty slick when you hit the puddles but otherwise it's sticking pretty good."

He went back out then. Times, which started at about five minutes, thirty seconds were coming down. First 5:20, then 5:15 and finally one car clicked through at five minutes flat.

Then it was our turn. Sutherland, Leavens and me. Colgate was still happily buzzing around in the reserve car.

"Watch the two half-lefts," Hayes had said. "They're slick."

I took off after a thud on the back from Geoff. Down the pit runway in low cog, past the beckoning flagman and out onto the course under the Amoco bridge. Then came the first half-left.

I took what I thought was a nice line. *Sure* it was. Just the other side of the turn, which in the dry can be taken in a racing Sprite at 5500 rpm in top gear, was a sheet of water. Sprite #55 shot straight sideways for about 20 feet. Like any newcomer I had taken the turn with room to spare — room for which I thanked whatever guardian angel looks after the likes of me. The next turn was a bit better, slick but no side-stepping. The entrance to the road section was treated, at least by me, with all due respect on this first lap. For two reasons. First, I had seen a Lotus dump through overcooking it on that corner a couple of years back. Second, I had just gotten around to discovering I hadn't bothered to fasten the seat belt. One thing I did notice though — nobody else was treating any part of the course with undue disrespect. Not that day.

The esses were slithery but Hayes was right. Where there were no real puddles the Sprite stuck very nicely indeed. Then the long bend — not flat out this time around but later taken full bore with ease. This time I was busy struggling with that damn belt. The hairpin came up fast but this is one you just haul down for and loaf around. Heroism here just wastes time. Then the warehouse straight, newly paved and dead smooth this year. Then Webster, the hard right, hard left and back out on the airport. And another puddle. And another sudden shot to the right. Next the long straight after a hard right turn. For me a 360 degree turn. Too much confidence, too much right foot and a puddle. By the time I got things sorted out I had done a long slow loop down the straight. Headed in the right direction still, I took off down the straight with the Sprite happily jumping puddles the whole distance. Then another straight and the U bend into the pit straight. It seemed as though it had taken a half hour — and probably had. The next lap was easier and the next easier still. Then the come in signal was flashed. It would have been welcome at any time during that first lap but now it was a bloody nuisance.

The rain had made things rough for us but doubly so for others. While the Sprites did their share of slithering, some of the other cars were almost unmanageable. It became a standing joke that the Sprites could turn in laps considerably hotter in this slop than such redoubtable machinery as Oscas, Stanguellinis and Lancias. Even the Alfas were given a rough time.

As one Osca driver put it in a mock fury that was only half simulated: "Every time I looked back there'd be a spray of water coming up. I'd pull over expecting a Porsche or something bigger and every time it'd be one of those pesky little Sprites!"

Thursday's practice session was cancelled. The rain had increased in fury making it virtually impossible to see through the streaming windshields. The night session was called off, too. Headlights shining on that wall of water just made it that much worse.

Friday was blessedly clear — not sunny, mind you, but clear or at least rainless. Out on the course we each got about three laps, all there was time for in the short session allotted. The rescheduled night practice allowed another three laps mostly for headlight checking and marker orientation.

Suddenly it was Saturday. Happily it dawned clear — even, believe it or not, sunny.

"Be at the course at eight o'clock sharp," Chambers had said. It was a wise precaution. Race day at Sebring begins early as spectators, officials, mechanics, drivers and anybody else connected with the event all try to get through one narrow road and one small gate at approximately the same time — normally about 9 a.m. If you head out before eight the normal five-minute trip takes only half an hour. If you wait until nine you'll be lucky to see the start from outside the fence.

When we arrived on the scene the Sprites were already lined up, ready. The next hour and a half was taken up with quiet talk and getting the working and timing pits ready. Finally came the call to drivers for the usual pre-race briefing and the cars were rolled into their starting positions.

Starters for the Sprites were Stiles, Leavens and Hayes. At the end of the count-down the sprint started and they were off, strangely enough in numerical order. 53, 54 and 55. Less than five minutes later they came around in the same order. Then the order changed. Hayes had turned a lap at 4:29.

Out went the "slow down" signal and the three little blue hard-tops started circulating between 4:30 and 4:40, depending on traffic. One thing became immediately apparent. In dry conditions the Sprites could go deeper into the corners than almost any other car and go through as fast as all but Porsches, Oscas and the like. Bigger machinery had to haul down earlier and go through most of the turns slower. This sort of thing had the flag-men on the corners ready for the men in the white coats before the first hour was up. A Sprite would come barreling into a turn followed by something bigger and faster; out would come a marshal waving a blue flag frantically at the little A-H. At first we would obediently move over only to see the larger car brake down a hundred yards further back and then loaf through the corner at ten miles an hour less than the optimum cornering speed of the Sprite.

From then on the Sprite drivers began to get selective, the flagmen seemingly unable to figure it out. If it was a Porsche or an Osca coming up, or if the approaching car was close enough that the sight of the Sprite in the line might be un-

Geoffrey Healey directs car preparation prior to the race.

Light, disc-braked Sprites could go deeper into corners than many fiercer machines.

Wet track hindered the Super Sprites less than other cars with more torque.

Sprite power never faltered during twelve hours. Big track, little car (below) combined to produce big results.

nerving we moved over. Otherwise we went through full tilt and *then* moved over to allow the faster accelerating car to go by.

First casualty of the team was Ed Leavens. A pair of rubber marker cones were kicked in his way by another car under somewhat less control. Ed came dragging the cones with him into the pit with a mangled tire, the result of battering from the markers but otherwise none the worse for wear. The car was soon sent on its way with a bare lap lost in the pits.

At three hours the other Sprites were brought in one by one, refueled and the drivers swapped over. Sutherland took over 53, Kunz went in 54 and I went in 55. For the next two hours I never saw another team-mate. We were about a mile or so apart and the lap speeds were so even — 4:32 to 4:35 — that no one gained or lost enough to see another member of the team.

Then it happened. Coming out of the hairpin, I went for third gear and the throttle felt spongy. The same went for fourth. At the approach to Webster, the 90-degree right, 90-degree left, I dropped to third and then to second and for an interminable second the throttle stayed flat on the floor. Then, before the willing little engine over-revved beyond 6600 (6500 was the limit for top gear, 6000 rpm in the intermediate gears) the pedal oozed back up. I toed it and found that with care I could use it even for downshifts. It couldn't be kicked but it could be juggled. The rest of the way to the pits was third and mainly fourth gear country anyway. Heading into the big U turn onto the pit straight and making a downshift there was a sudden harsh rasp. Sudden memories of a similar noise that heralded a broken crank in a larger Austin Healey came flooding in.

But it wasn't. One of the tuned exhaust pipes had apparently fatigued and cracked. The noise was just raw exhaust from one port. I made the pits sounding like a thrashing machine. Except for the pipe and the broken throttle return spring the car was intact. It took about 15 minutes for the efficient mechanics to replace the spring and with the aid of a cut up beer can and a bit of wire to repair the exhaust. Johnnie Colgate hopped in and was off to resume the grind. Within a few minutes the others were called in for fueling and driver changes.

Then, at about six hours the clouds came drifting over.

Within a few minutes big drops, just a few, fell. We speculated; did we want the rain or didn't we? It would slow us up but it would slow the others up more if practice was any criterion. Then, again we were doing well in dry weather. There wasn't anything we could do about it but talk. We got the rain whether we wanted it or not.

As the drizzle turned into a real rain, the signalman went out and flashed a new sign to the MGs and the Sprites. In big block Da-glo letters it read:

EASY DOES IT LUV

Small puddles became big ones and then turned into lakes. Big machinery that had been thundering by moments before slowed to a comparative crawl. Two cars, a Porsche and a Lotus went by side by side by each with one sending a continuous shower into the other the length of the straight.

The Sprites continued their grind, now slowed down to five-minutes-plus a lap. Even the big equipment was well up in the four minutes and some odd seconds per lap.

Then 55 was overdue. One minute went by and then another and then yet another. Just as the wait began to get unnerving, Hayes, who had taken the car from Colgate for his second stint, came sputtering in. This time it wasn't just a throttle spring. The whole linkage had come adrift in the road section. Hayes, with rare presence had unbuttoned the hood and set up the fast idle screws to 2500 rpm and puttered back in where aid was available. If nothing else it was an answer to those who maintain there is no need for a racing driver to know anything about his car mechanically. Three laps went by while the resourceful crew taped and wired the linkage together and Hayes went out again with instructions to finish the race since the load of fuel taken on during the stop was enough to carry him through.

Kunz then came in. The car was gassed and checked. Sutherland hopped in and started off. He got about ten feet and stopped. Awful noises had come from the gearbox. Still in the Sprite pit area, the car was checked and it was discovered that first and second gears were useless and third possibly damaged. Donald and Geoffrey had a quick conference and Sutherland was sent out, told to use top gear as much as possible and third only in emergencies. The other car suddenly came bump-bumping in with a flat. On inspection the tube was found to be entirely gone — missing completely. The car had, up to then, only two unscheduled pit stops, once for the pylons caught in the underpinning and once for a stuck gear lever. A quick tire change and fuel-up and out it went with Leavens up still leading the class.

That, thankfully, was the last of the damage. The next hour and a half went uneventfully.

The finish order was Sutherland/Stiles, Leavens/Kunz and Hayes/Christy/Colgate. All three cars finished, somewhat the worse for wear, true, but they finished one, two three in class beating other cars in classes much higher and even breaking up the finish order of the redoubtable DOHC Abarths. In fact one, #55, was in good enough shape to be driven, with no more than a plug change, to California starting the next morning but that's another story.

As for this particular story, I for one am proud to have been part of it and proud of the mechanics, the cars and the team that made it possible. Thanks, fellows.

—John Christy

Inside Sebring

Sebring is rather like the proverbial iceberg—most of it remains unseen. Not even considering the months of background planning and organization, it is still much more than just one long day's racing. A vast amount of activity goes on before, during and after the race itself. yet even the event's most involved participants see little more than what takes place right around them. The driver, town resident, mechanic, policeman, pit steward, hot-dog seller, spectator — each views the race in a different way, and at Sebring it isn't easy to see the entire picture because its various parts are spread jig-saw puzzle fashion over a large area.

The circuit is seven miles from town. The Cunningham group is out there while the Scuderia Ferrari is established in the Oldsmobile garage at the north end of Sebring's main street. The works Porsches are at the fairgrounds, the Sprites at Avon Park, 10 miles above Sebring. The race headquarters is at one place, the press headquarters at another. It is not at all unusual for one of the competing cars to be located 15 miles from the course in one direction while the driver of the car is staying at a motel 10 miles from the starting line in another direction. At all these places things were happening and we've tried to show some of these things as they were going on. We've also tried to capture the excitement of the practice sessions and to show you the race itself "behind the scenes."

Story and photos by Irv Dolin

Race morning, 6:30 A. M. It's hard to get a decent web (left) built with all these cars going by. The pre-race drivers meeting (above) is an established Sebring tradition.

Paddock scene . . . day before the race. Reports that several small cars sank out of sight were greatly exaggerated.

Isabelle Haskell de Tomaso (below) tries her hand at number painting on the 750 cc Osca. In the background are the three "works" cars. The envy of everyone. HE had an umbrella.

Rod Carveth (above) brings his Ferrari into the pits after pushing it nearly four miles . . . he will, in the future, check fuel consumption.

A plastic-covered John Fitch and friend (above) wait for rain to cease.

1959:

One of those working press photographers you've heard so much about. Bonnier (below) listens to some vital information from von Trips during a driver changeover.

Phil Hill waiting to take over during practice in the rain. Note modified slicker sleeves.

Denise McCluggage and Ricardo Rodriguez exchange opinions (above) during night practice.

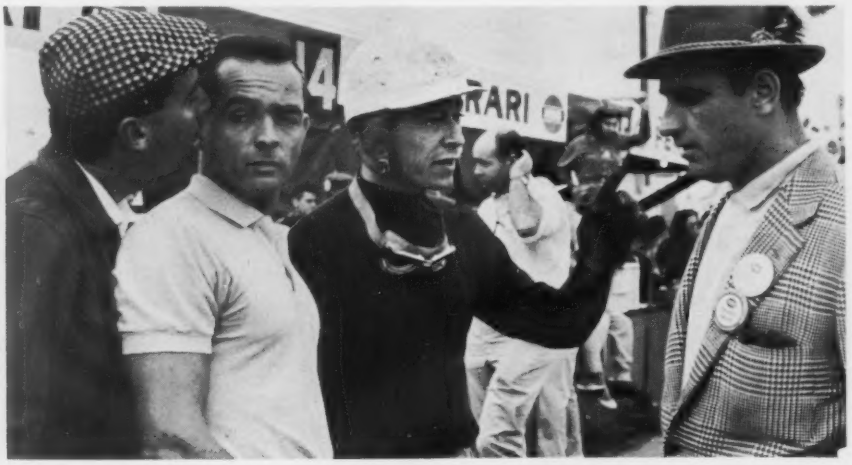
No, this isn't an Indian religious riot. It's merely the finish of the race. At Sebring, pit stewards (left) must be versatile.

Cheered on by a girl and a friendly dog, tired mechanics manhandle one of the Ferraris up the loading ramp of the truck after the race. Sebring residents find nothing unusual as odd-looking cars rasp along the town's normally quiet streets at all hours of the day or night.

Ferrari Team Manager Tavoni slows his charges down as the race draws to an end.

At Sebring both man and machine need fuel. A mechanic refuels surrounded by cans of gas for his car.

Momo inspects water-cooled brake. Lister-Jags did not use them during race due to their failure in practice.



Cahier seems to be giving Phil Hill some inside information, while Oilivier Gendebien makes something plain to Harry Schell's brother, Philippe. Race cars are like babies—they require a lot of floor pacing through the night, here Lotus lovers work late (left) the night before the race.

brake.
during
ractice.

Spectating at Sebring

Story and photos by Irv Dolin

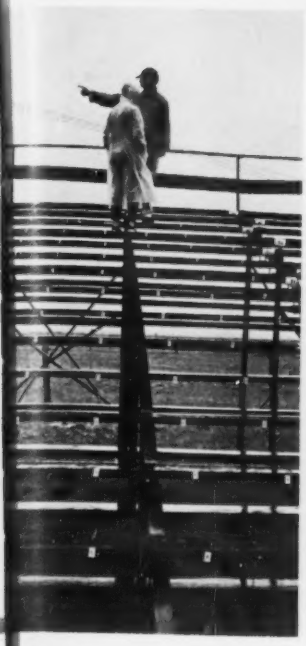
The Sebring race is one which allows the spectator to do much more than simply drape himself over a snow fence for a few hours, as he might do at a Lime Rock event or Pomona. No, Sebring is an occasion and the spectator acts accordingly. He appears on the scene very early – sometimes days early – equipped with car, wife, offspring, food, camera, binoculars, blankets, extra funds and tremendous enthusiasm. (This year, if he was really prepared, he also brought along foul-weather gear.) Some people make even more elaborate preparations and show up with portable scoffolding, tents, miscellaneous furniture, backyard ovens, iceboxes and enough provisions to equip an African safari for six months. The spectator is there to enjoy himself and he does. If he tires of car watching he can wander over to the midway near the main grandstand. There he can purchase gooey inedibles, funny hats or other suitable souvenirs. (There was no ferris wheel to ride on this year, however.) When it's all over and he's inching his way out in miles-long bumper-to-bumper traffic, possibly in company with the works Ferraris on their way back to town, he may wonder why he did it, but come next March he'll almost certainly be back again, complete with all the aforementioned personnel and equipment—plus a few extras he may have overlooked this time. The accompanying photographs show the spectator in action.

'59 fashion note: more and more men are wearing bowlers. Men of action, however are turning (below) to the white plastic crash hat.

Yes, Sebring is a tough course for drivers and spectators alike.

"My lands don't those little cars make a lot o'noise." This one (right), however doesn't— it's run by battery.

Old or young, classic lines are classic lines. Two trim spectators watch action over heads of crowd. Vintage car cavalcade (above) was a feature of this year's Sebring.



"Man! Those cars are really flying."

Only a few spectators (far left) were brave enough to use the grandstand during the wet practice sessions. "Let's see now, if I sold my TD and got a night job I might just be able to swing it." Everybody (below) had to make pit stops.

A tough decision . . . is the feathered model more dashing than the crash hat design?

Race day crackled with excitement and tension. Well, not really, but everybody had a good time.

1959:

SCI **ROAD TEST:**

STUDEBAKER LARK VI SEDAN LARK VIII STATION WAGON

WHENEVER a new car is introduced, the first task for viewers and reviewers alike is to decide exactly what market the manufacturer is pitching for. After all, it's hardly fair to condemn a pseudo-sports car when the maker is really intending to sell it to tired old businessmen.

Well, there were some businessmen in South Bend, Indiana who were tired alright, tired of watching the sales curve dipping downward. Having their heads screwed on properly, they proceeded to take a good, long look at the state of the car market.

Recognizing that they had gotten an unsatisfactorily small slice of what till lately was the huge market for equally huge cars, they decided it might be better to be a relatively larger frog in a much smaller pond.

With their confidence in a more economical car's prospects bolstered by last year's Scotsman, they set to in a crash program to prepare tooling for the new series. The basic concept was that if a full-sized car which looked economical was successful, then a similar car which augmented these virtues by eliminating the pretense of being a "big" car would be still more successful. Better still if it could be done with a minimum of retooling.

The result is the Lark, and to judge by what we read in the papers, a revival of civic confidence in South Bend. The key words used by the admen to describe the Lark are "compact" and "sensible." They accurately indicate the market being aimed at; city-dwellers to whom space is dear and economy-minded owners who need a six-passenger machine but don't care for jukebox styling, no matter how beautifully proportioned it may be.

We tried two quite different Larks, a light-gray four-door sedan with the six cylinder engine and overdrive (not quite a stark Lark) and a green two-door station wagon with the V-8 engine and automatic transmission. Both were driven to Sebring and back by our stalwart test crew and both have seen lots of urban-suburban traffic in the New York area before and since. We are quite convinced that the six especially is unsuited for heavy cross-country work as its 90-hp leaves it definitely in the poopy category when trying to overtake at 50-plus mph. No doubt about it, we've been spoiled by the horsepower race and we do not like having to plan our passing maneuvers so extensively.

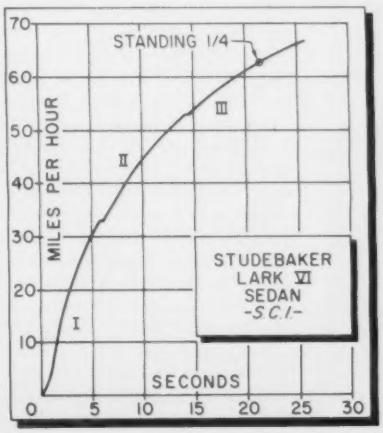
In town, it's quite another story, and one that snuck up on us unexpectedly. If you pretend it's been mildly souped, with a larger carburetor and a semi-race cam and therefore you hang on in each gear right out past peak power, why, then you find you are running out in front and the Lark VI feels very spirited. Our first ride in a Lark was in a taxi version (there are several hundred of them in NYC now) and the driver treated it as if there were seven or eight liters under the hood and then complained about the poor acceleration. In this respect, it's much like many of the imports, what performance there is isn't world-shaking, but it's always available and easy to use. The gear ratios aren't too close, they can't be when you've got a three-speed box. But Studebaker has spread the ratios as nicely as they possibly could with a 1.6 : 1 step with both shifts. (Third is direct, second is 1.63/1 and first gear is 2.60/1.)

Our six had the Borg-Warner overdrive and accordingly, the rear axle ratio was 3.73/1 instead of 3.54. At any speed above 30 mph, momentarily lifting one's foot off the accelerator pedal permits it to engage automatically. A kickdown switch under the same pedal provides instantaneous shifts back into direct. A hand control lets you lock the device completely out but unless this is used, the car will free-wheel (no engine-braking) in any gear below 25 mph.

The result is much the same as having a four-speed gearbox with automatic shifts between third and fourth, or, since second-overdrive is so similar to third, between second and "third." The latter is rather fun in city traffic, though the free-wheeling may induce you to forget you're still in gear until the car speed drops to corre-

Lark six (top left) is Studebaker's '58 flat head de-stroked to increase gas economy. Sedan (left) can be converted into fairly comfortable sleeping quarters. Split seat back makes it possible for passenger to cat nap while underway.

Truncated Lark sedan (top) amazingly does not give away many cubic inches in the trunk department. Center-mounted spare is possible source of suitcase scars. Wagon and sedan (right) very obviously belong to the same family of compact cars. Wagon is fitted with top-mounted chrome luggage rack.



Lark wagon (top) has LST capacity with rear seats down and tail gate open. Spare is stowed under rear compartment floor board. Studebaker V-8 has more than enough muscle to tote spring creaking loads.

spond with engine idle speed and suddenly you find you're lugging the engine and about to stall it.

The column shift is fairly taut, though reverse was still stiff to engage even after 6000 miles had come and gone.

About pretending the engine's been hot-rodded, in a sense it has. But the engineers had one strong limitation on them. The Larks, both VIs and VIIIs (we're fascinated by these Roman numerals), are intended to run on regular gasoline rather than premium or super. And for economy, both of operation and first cost, there is only one carb. So to squeeze out extra power, familiar tricks of the hot-rodding fraternity were used. First they settled on the highest compression ratio suited to current "regular" gas. This turned out to be 8.3/1 compared to last year's 7.5/1. Alterations to the camshaft and carburetor, not to forget the reduction in displacement from 185.5 to 169.6 cubic inches, brought the peak torque down from 152 lbs-ft to 145.

That drop in displacement came from chopping the stroke to four inches even. Though that hardly qualifies it as a short-stroke, it certainly is a step to encourage revving, what with lower piston speeds and increased bearing overlap. And as we've already indicated, the proper way to drive the Lark VI is to use lots of revs.

Just to make the engine's life easier, the weight is reduced some 120 pounds from the '58 models. This came about from the general shortening process that occurred on the drafting boards, but to brush the Larks off as merely last year's models with 8½ inches chopped out of the middle and most of the overhang amputated is to overlook the many detail changes which add greatly to the ease if not joy of owning such a straight-forward, functional car.

The simplicity of the car's lines not only reduces the expense of the stampings but adds considerably to the car's appeal. Some prospective owners have no wish to advertise their social or financial standing—and not because they have none.

Another practical virtue is that cars with clean lines are much easier to keep clean. Some feel that such a car avoids minor traffic dents better than more ornate ones, too. There's no step-down (and clamber-out) frame, so inside the floor is flat and a whisk broom replaces the vacuum cleaner as a how-to cleaning tool. All fenders are attached with bolts which means that if you tear one, you needn't weld the next one on.

There is no doubt that the Lark is intended as a sensible, economical transportation. What then is it like to drive?

Both the sedan and the wagon share the same dashboard styling. Wagon (above) was fitted with Studebaker automatic transmission.

Well, to start with, the engine occasionally was difficult to start, especially in damp weather. We're inclined to blame the automatic choke which would introduce itself into the proceedings even when the engine was fully warm. Though easily eliminated by a heavy blip of the throttle, perhaps another step backwards would be in order, as hand chokes rarely give you trouble.

On slow idle the engine seemed a bit rough, perhaps an inevitable result of the extra high compression ratio. And to cap these minor unpleasantries, the clutch throw-out disc was mis-aligned. Combined with soft engine mountings and a rear axle entirely dependent on the limber leaf springs for longitudinal location, every start was made with a shudder that fed its way back into the throttle pedal.

Light overall weight and an ability to rev past peak power gave the six satisfactory performance away from the traffic signals. At high revs, the engine retains a determined sort of hardness that reminds you that it's working for you. Quite unlike the turbine smoothness of the V-8 which, coupled to the Borg-Warner automatic transmission (dubbed Flightomatic) gives typical American performance — smooth, yet very brisk. Unless the few extra miles per gallon mean a lot, the smoothness of the eight makes it altogether more satisfactory. The six, of course, is noticeably cheaper to buy and maintain.

Under the hood accessibility looks good on the six, though the dipstick is so long and so far to the rear that it must be bent slightly to clear the opened hood. A plain paper air filter traps the dirt but not all the sounds at the carburetor. The battery is far forward on the left fender well in both cars, probably the coolest under-hood location available.

Seat adjustment fore and aft is large enough to raise a complaint from the rear seat passengers, but since the prospective customer rarely rides back there, this should cause no problems for him. A good deal of the decrease in wheelbase seems to have been accommodated by shortening the rear seat cushion, but as long as the front seat is not all the way back, the back one is plenty comfortable.

The backs of the front seats are also adjustable for rake, If the front seat is adjusted to its full-forward position, the backs drop down flush with the rear seat cushion, to make a bed. The passenger can stretch out alone while the driver presses on alone, or both sides can be lowered, converting the Lark into a miniature bedroom. Perhaps a No Vacancy sign may be offered soon as an optional extra.

Our main complaint about the seats is our usual one; no lateral support. Even with the small transmission bulge pushing the pedals to the left of the steering column center line, the driver, more likely than not, eventually is found slouched against the door, his left elbow on the armrest and his hands on the wheel at seven and two o'clock. Not easy to stay alert when you don't even look alert. The accelerator pedal, typically for American cars, has its hinge point about an inch or so back from the floor board. Unless you assume the catty corner seating position just mentioned, you find that either the left foot doesn't quite reach the floorboard or the right leg is inadequately supported by the seat. We're beginning to wonder who shaped these Mr. Averages that are used so much in American design studios.

The Lark has a very pleasant, attractive instrument panel with, thank goodness, a round, yea, even circular speedometer dial. What will they think of next? Warning lights care for oil pressure and amperage deficiencies, with gauges present for fuel supply and water temperature. The latter rises quickly to its operating figure, enabling the excellent heater-defroster to be used within a half-mile or so. Of the four knobs around the instrument cluster, the upper ones operate the headlights (good) and the windshield wipers (two-speed electrical—especially important on low powered cars). A two speed fan for the heater and a combined heater vs. defroster and thermostat control (whose knob fell off) and the ignition key/starter complete the dashboard array. Just under the edge are tee handles and knobs for the hood release, fresh air intakes and the overdrive lock-out. The radio at the center of the dashboard has good selectivity and power and excellent tone. (Not the push button model, incidentally).

Despite the drastic surgery, the trunk seems to have suffered not at all. The advantage of squared off lines is that the flat panels can enclose really useable space. Our only complaint about the trunk is a usual one, those little sharp edges which chomp away at your leather suitcases, mile after mile. The station wagon, on the other

(Continued on page 80)

STUDEBAKER LARK VI SEDAN

Suggested List Price, FOB South Bend, $1995
Manufacturer: ..... Studebaker-Packard Corp., South Bend 27, Ind.

PERFORMANCE

TOP SPEED:

Estimated	80 mph

ACCELERATION:

From zero to	seconds
30 mph	5.0
40 mph	8.5
50 mph	12.7
60 mph	19.0
Standing ¼ mile	21.7
Speed at end of quarter	63 mph

SPEED RANGES IN GEARS:

	(4300 rpm max.)
I	0-33
II	0-53
III	10-top
III-OD	25-75

SPEEDOMETER CORRECTION:

Indicated Speed	Timed Speed
30	27
40	36
50	45
60	54

FUEL CONSUMPTION:

Lark VI	18-20 mpg
Lark VIII	14-18 mpg

SPECIFICATIONS

POWER UNIT:

Type	In-line, Water-cooled six
Valve Arrangement	side-valve
Bore & Stroke	3.00x4.00 in. (76.2x101.6)
Stroke/Bore Ratio	1.33/1
Displacement	169.6 cu in (2781 cc)
Compression Ratio	8.3/1
Carburetion by	Single-choke downdraft
Max. Power	90 bhp @ 4000 rpm
Max. Torque	145 lbs-ft @ 2000 rpm

DRIVE TRAIN:

Transmission ratios		(optional ratio)
I	2.66	(9.69)
II	1.63	(6.08)
III	1.00	(3.73)
III-OD	0.78	(2.91)
Final drive ratio	3.73	(3.54, 4.10, 4.27)
Axle torque taken by	rear springs	

CHASSIS:

Frame	Box-section, ladder type with 4 cross members
Wheelbase	108.5 in.
Tread, front and rear	57.4, 56.6 in.
Front Suspension	Independent, coil and wishbone
Rear Suspension	Rigid axle, semi-elliptic leaf springs
Shock absorbers	tubular
Steering type	cam and twin lever (V.S. cam and lever with roller stud)
Steering wheel turns L to L	5.0
Turning diameter, curb to curb	37½ ft.
Brake lining area	146.4 sq. in.
Tire size	5.90x15

GENERAL:

Length	175 in.
Width	71.4 in.
Height, loaded	57.5 in.
Weight, as tested	2870 lbs.
Weight, curb	2720 lbs.
Weight distribution, F/R as tested	44/56
Fuel capacity	18 U.S. gallons

RATING FACTORS:

Specific Power Output	0.53 bhp/cu. in.
Power to Weight Ratio (as tested)	31.9 lbs./hp
Piston speed @ 60 mph	2000 ft./min. (1560 in OD)
Braking Area	102 sq. in./ton
Speed @ 1000 rpm in top gear	20.0 mph (25.7 in OD)

Nonchalant driver waits for start of his race. Bump just aft of his elbow is carburetor air intake.

RED RACING

One of the most interesting aspects of Russian sports car racing is the fact that it is strictly amateur. In the past it has not been encouraged by the Government, because it only served to point up the lack of passenger cars in the country. Recently, however, the Soviet hierarchy has discovered automobile racing. Through the various sporting clubs funds have been appropriated to aid specials builders, and in general encourage drivers. All the cars raced are based on parts from the seven civilian models manufactured in the country.

If automobile racing follows the trend of other sports in the Soviet Union — in the attempt to have international winners in every category from ping pong to shot putting— then we may see special cars and drivers appearing on European circuits to compete against the best that can be produced by the Continentals.

Soviet engineering has shown what it can do — if the Kremlin leaders decide that international racing provides enough of a propaganda sounding board this knowledge may be brought to bear on the problems connected with the construction of ultra-fast competition cars. —*ww*

There are very few activities conducted in a casual manner in the Soviet Union. Drivers, clad in motorcycle leathers, line up for instructions from the flag marshal before the start of the national championship race.

Two-man crews sprint for their waiting cars at start of 330-mile race. Course is situated outside the city of Minsk. One lap equals 11 miles, and contains 36 different types of curves and bends.

Valery Shakhverdov, the USSR champion in the 2500 cc class, takes his winning No. 14 (above) on a lap of honor around the Kirov Stadium. A winner (below) of the Fourth USSR Automobile Road Races receives his prize. Russian cars must have plenty of boot room around the pedals — or the heel-and-toe technique hasn't penetrated the Iron Curtain.

Way-out Russian single seater has fully streamlined body, rear engine, and tuned exhaust system. Car exhibits better finish than that found on the majority of Russian competition machines.

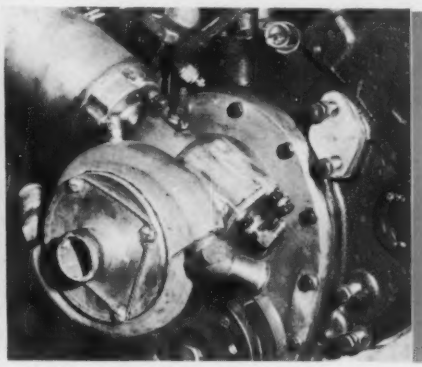
All photos P.I.P.

Flounder-flat single seater is backed into take-off spot before Le Mans start. Rear end of body is raised to keep car from becoming airborne on long fast straights.

Prescription for Performance

by W. G. "Racer" Brown

Scarab uses tuned exhaust system. Individual pipes measure 32 inches from block to main pipe. Length was determined by experiments on dynamometer.



All out Chev can profit from magneto ignition. Unit on Scarabs necessitates special drive.

IT ISN'T possible to fully appreciate the Chevrolet V8 engine until it has been seen, heard and felt in action in fully modified form. The characteristics and responsiveness of the engine are unlike any other production engine in the world and are certainly divorced from the usual run of wedge combustion chamber, push-rod overhead valve, Detroit-inspired V8's.

Before launching a full-scale modification attack, several important items must be seriously considered. First and foremost is the matter of engine size; how many cubes? With two basic cylinder block bore sizes to choose from, it is possible to build an engine from 265 to 351 cubic inches in increments of about 10 cubic inches, and still retain a very good reliability factor. Is the engine to be used for street and road and an occasional bash? Or is it strictly for racing? An "aye" to the former question will involve some compromises that are neither necessary nor desirable in obtaining maximum power and torque from the strictly racing type of powerplant. Next is the type of fuel to be used most predominantly. Obviously, gasoline for sports cars. But then the quailty of gasolines vary from one area to another, which will affect the maximum usable compression ratio, the air/fuel mixture ratio and ignition timing. Variations in altitude also influence these factors. Supercharged or normally-aspirated? Here again a lot depends on the answer.

Last, but not least, the problem of maintainance arises. Racing engines, regardless of type or origin, demand lots of time for careful and efficient preparation. They also require rather frequent replacement of parts. Major last-minute changes are, or at least should be, out of the question. Ditto for postponement of routine inspection and parts replacement. "I haven't even lifted the hood in six months" is heard with amazing frequency, even related to bona fide racing equipment. Obviously then the only thing that keeps the poor neglected engine together is the fact that performance has slowly deteriorated to the point where the engine isn't producing any power and, consequently couldn't blow up if it had to. Either that or the engine is waiting to explode as the infamous words are uttered. Unfortunately, engines are not idiot-proof, nevertheless there is no real excuse for ruining one. Stopping troubles of all kinds before they can do any damage is the most important phase of maintainance and this requires the most intimate kind of knowledge of an engine's workings. If, therefore, you are not prepared to lavish time and attention upon your engine, better forget about the racing conversion and concentrate on the less powerful types, which are inherently less prone to catastrophic explosions.

Another facet worthy of exploration is the distance or time involved in races. In all but the most extreme cases, there is no real threat here to an engine's longevity. However, for thousand mile races and the like, a few compromises are again advisable to keep the engine in one piece for the distance.

Let's gab a bit about power and torque. Here when horsepower is mentioned, I mean observed, sustained, big, fuzzy American brake horsepower, undoctored by unrealistic correction factors and uncontaminated by salesmanship and "flash" dyno readings. The Americans are not the only ones with exaggerated ideas about power. Quite recently, a 2½ liter four cylinder Italian racing engine was checked on an American dyno. This engine was factory rated at 280 bhp at 6500 RPM using gasoline. Razor-sharp and super-tuned, it pulled 240 honest U. S. horsepower or 14 percent less than advertised. Still, this is 1.58 bhp per cubic inch. A sharp 1½ liter twin cam Coventry Climax will actually produce 145 bhp at 6500, or 1.6 bhp per cubic inch. About the most we can expect from a thoroughy modified 265 cubic inch Chev is 1.24 bhp per cubic inch. This will drop to about 1.14 bhp per cube for the larger bored and stroked versions. The basic difference in specific output between the two examples above and the Chev is that of gas flow into and from the combustion chamber. With the Chev, we are forced to accept compromises in porting due to production demands and in available and usable space for valves because of the wedge type combustion chamber, in which the valves are located side-by-side in single file down the head, as opposed to the lateral disposition of the valves in a hemispherical chamber.

But there is more to it than porting and physical valve dimensions. In a hemispherical chamber with the valves located opposite each other, there is, or can be, a considerable scavenging effect during the valve overlap period when both valves are slightly open. During this period, while the intake valve is opening and the exhaust valve is closing, the inertia of the departing exhaust gases induces part of the incoming air/fuel charge to exit with the burned gases. This means that the air/fuel

A competition Chevrolet in full song. The Scarab sports cars are perhaps the finest example of the use of super-tuned production engines adapted to the rigors of competition. The Chev-based power plants in these cars produced 340 hp.

charge makes a full sweep across the combustion chamber from the intake port toward the exhaust port. This sweep cleanses the chamber of exhaust gases; not entirely, but the dilution of the air/fuel charge by residual exhaust gases is greatly lessened with a well-designed hemisphere than with any other type of chamber. Thus the hemisphere is more receptive to ram tuning and long overlap periods at high engine speeds and this receptiveness shows up as additional top end power. Not so with a wedge chamber. During the valve overlap period with this type of chamber, the incoming air/fuel charge is actually "short-circuited" from the intake port to the immediately-adjacent exhaust port, leaving the remainder of the chamber volume, and by far the greater portion, unswept, uncleansed and unscavenged of residual exhaust gases. Needless to say, this dilutes the remainder of the incoming charge to an extent that limits the amount of available power. Long valve overlap periods here are out of place. But by the relatively simple expedient of a good exhaust system, this condition can be relieved, as we shall see.

However, what the Chev lacks in top end horsepower, it more than makes up for in mid-range torque. This engine doesn't develop gobs of torque, as do some Detroiters, but what is developed is in the engine speed range where it can be used to best advantage. A specific value of 1.05 pounds-feet of torque per cubic inch in the 4000 to 5000 RPM range is attainable and quite common for modified Chevs and can be as high as 1.18 pounds-feet per cube. On the other hand, the very weapons the Europeans use to obtain higher power at higher speeds, ram tuning and long valve overlap periods, both effective within fairly narrow speed ranges, combine to defeat mid-range torque output. Overall, the modified Chev has a very definite advantage, except possibly for the very fastest race courses where absolute maximum power dictates lap times. In this country these courses, perhaps fortunately for our cause, are practically non-existent. But it's safe to state that a modified Chev engined competition sports car is capable of winning over European rivals on any road racing course here and a good many abroad. This fact has been repeatedly and forcibly demonstrated by the Reventlow Scarabs and by the Sadler machines. Unconfined as we are to the existing 3-liter International sports car formula, we need not concern ourselves too much with specific power and torque outputs. We must, therefore, concentrate on the highest practicable net outputs for the engine size we have chosen. So the modified Chevs cannot be written off as second-best in any league.

CYLINDER BLOCK ASSEMBLY

The machine work to the cylinder block, crankshaft, connecting rods, cylinder heads, etc., described in last months' tale become mandatory when building a first-class modified power plant. The data regarding bearings, bearing clearances, torque limits and other miscellaneous details apply equally to the modified engine as to the stocker.

There are several important exceptions. If the Chev has any notable weakness, it is in the main bearing department caused by a slight but definite lack of stiffness in the cylinder block structure. Special steel main bearing caps for the four forward bearings are therefore advisable because of considerably higher cylinder pressures the engine will develop in modified form and slightly higher average engine speeds. These steel main caps are not a cure-all but they are a definite help and they will not break as stock cast iron caps have been known to do. The stock rear bearing cap is retained. The procedure here is to install the steel main caps in the block, checking them for a snug fit in the shallow recesses provided for them, torque them to 75 pounds-feet and very carefully line-bore the caps to size. Number the caps so that they won't become mixed up or turned around. Semi-finished heavy-duty copper-lead main bearings are available from Federal-Mogul, these being compatible with the crankshaft material and hardness. The bearings are properly installed in the block and main caps, the caps assembled to the block then the bearings are line-bored to give from .002 to .003 in. operating clearance between the bearings and the crankshaft main journals. Substituting these Federal-Mogul bearings for the standard Chev Morraine "400" aluminum bearings is about the only way out because the Morraine bearings are not produced in semi-finished form, which means that they are not resizable and, therefore, cannot be line-bored. This operation automatically corrects for any misalignment in the main bearing bores of the block and is a job best left in the hands of a capable automotive machinist. Use genuine Allen socket head cap screws or their heat-treated equivalent, with drilled heads for safety wire, for securing the main caps to the block. Correct thread length is critical to avoid bottoming the screws in the blind tapped holes in the block.

As pointed out in the last issue, '57 and later Chev cylinder blocks are more desirable than earlier ones because of increased structural stiffening in the main bearing webs as well as ⅛ in. larger cylinder bores. However, the piston displacement chosen for the engine will determine which block to use: pre-'57 or post-'57. As it happens, the earlier 3¾-inch bore, 3-inch stroke 265 cubic inch assemblies fall neatly within the American Power Boat Association rules for 265 hydroplanes. Of no small significance is the fact that all the top 265 hydros in the country are Chev powered. The straightaway record is held by a small DeSoto but this thing can't get out of its own way in closed-course competition.

But, back to relevancies. The early blocks can be bored safely ⅛ oversize to 3⅞ inches, which is the standard '57 and later size, except for some passenger cars and trucks. '57 and later blocks can also be bored safely ⅛ inch over to 4 inches. These figures should be regarded as maximum for distortion-free cylinder bores. If possible, the block should be closely examined before boring for signs of core shifting, which can easily lead to cracked cylinder walls or at least to bore distortion. In the case of supercharged engines, the maximum bore size should be held to .060 in. over standard.

Special pistons for the Chev are available in any bore size from 3¾ to 4 inches and any stroke length. The notched stock Corvette pistons, with either flat crown or shallow inverted V-crown used in fuel injection engines, are certainly sufficiently rugged but they are very heavy. Also, they are only available in bore sizes from standard to .040 in. over and only for the standard 3-inch stroke. Whenever possible, piston crowns should be flat except for

properly located and sufficiently deep notches to prevent interference with the valves during the overlap period. Wedge-top pistons should not be used unless the compression ratio cannot be raised sufficiently without them. The reason is that the highest part of the wedge crown is right smack in front of the spark plug at or near top center, a point that practically guarantees somewhat abnormal combustion. Pistons should be of the three-ring solid skirt type ground to either a "D" or "E" cam for racing purposes. Snap ring grooves should be specified to retain the full-floating piston pin. Specified clearance between the piston skirt and the cylinder bore will vary with the piston manufacturer but will generally fall within .006 in. for mildly modified engines to .008 or .009 in. for all-out versions.

When pistons are ordered, special attention must be paid to the piston ring grooves. There are several very good brands of piston rings on the market and the ring grooves must be machined to match the rings. But the excellence of compression and oil control afforded by the Perfect Circle "98" rings cannot be denied for extreme service conditions over long periods. This ring set conforms to SAE standards for 5/32 in. wide compression rings and 3/16 in. wide oil rings. Rings must be individually fitted to pistons and bores. End clearance in the bore must be from .014 to .018 in. and side clearance in the ring grooves must be from .002 to .003 in. for the two top rings. Piston pins must be a light push fit in their bores. Pins must be of reasonable wall thickness and the length must be right for the pistons. Pins with high core hardnesses are not desirable because of brittleness and inflexibility. Pins marketed under the tradename of Nylen have relatively soft cores, are chrome plated for long life and are generally well-suited for competition engines.

Pistons must be x-rayed for flaws, the Zyglo process sometimes being inconclusive. Pins must be magnafluxed. The piston assembly, including the piston, rings, pin and pin retaining clips must be balanced for equal overall weight. As for a choice between the methods used for producing special pistons; sand castings, permanent mold castings or impact extrusions, commonly called forgings, flip a coin. We have used a great number of pistons produced by all three methods and have yet to experience a failure. Detonation is the prime cause for ruined pistons and if detonation is avoided, there is no reason to believe that a piston will fail, provided the pistons are thoroughly inspected and properly installed.

When the engine is partially assembled, install one head gasket, one head, the camshaft, the valves and valve gear for one cylinder. Before bolting the head in place, apply a strip of modeling clay about 1/8 inch thick in the valve reliefs in the piston. Bolt the head on, set the correct operating valve clearance and rotate the engine by hand at least two complete revolutions. Remove the head and very carefully measure the depth of the clay at its thinnest section. The minimum acceptable clearance between the piston and valves must be no less than .060 in. This will give sufficient clearance for momentary valve float. If machine work is necessary on the pistons to correct the piston-to-valve clearance, have it done before the pistons are balanced.

Connecting rods for our engine are stock Chev. They must, by all means, be competently rebuilt, even though they are new, as outlined in previous issues. The piston pin bore of the rods should be honed for a light push fit of the pin. Rods, caps and bolts should be magnafluxed. It's a very good plan indeed to shot peen the rods and caps for improved fatigue resistance.

The opinion is often expressed that Chev crankshafts with stroke lengths altered from the standard 3-inch are not reliable and cannot be trusted for extreme service applications. To which I have to say one word: Nonsense! There are two qualifications however; first, if the stroke increase is within reason and, second, that detonation be avoided as if it were the plague which, as far as internal combustion engines are concerned, it is indeed. Avoiding detonation only makes good sense for the entire engine and its quality of performance, not merely to safeguard pistons, connecting rods, crankshafts, main bearing caps, webs, etc. If a magnafluxed, x-rayed, spot peened and properly installed stroker crank breaks in operation, the chances are excellent that a stock crank would also break under the same conditions.

Stroked Chev cranks are available in 1/4, 3/8 and 1/2-inch stroke increases, although any stroke length between standard to as much as 3/4-inch increase may be had on special order. The 3/8-in. stroke increase (total stroke 3 3/8-inches) is currently the most popular and is a good compromise between extreme reliability, piston displacement increase and the gain in power and torque afforded by the larger engine. The best stroker cranks have material similar to the parent metal welded to the crankpins before the pins are ground to the new stroke length. New stroked cranks come with standard size crankpins and .010 in. undersize main journals which must be taken into account when bearings are ordered. The crank should be shot peened and the crank, rod and piston assemblies must be statically and dynamically balanced.

Correct procedure for installing the crankshaft, rod and piston assembly, measuring bearing clearances, etc., were mentioned in last month's issue and are applicable to our modified engine. Morraine "400" aluminum rod bearings should be used. In good condition, the stock Chev oil pump produces sufficient pressure and flow for a modified engine.

CYLINDER HEADS

The use of '58 or later Corvette fuel injection cylinder heads is recommended, although any '56 or later Corvette heads are acceptable. Earlier Corvette or passenger car heads have considerably smaller intake ports and are not acceptable for our purpose. The '58 and later Corvette (not passenger car) injection heads (Chev part number 3752843) have a small water passage beneath the spark plug boss that other heads do not have. The definite need of extensive modifications to the heads cannot be overemphasized. While it is true that the stock Chev ports and valves will pass great quantities of air, it is also true that if they are correctly modified, they will pass very nearly as much air as late modified Chrysler hemisphere heads and they will certainly pass more air than any other wedge type combustion chamber in the world. Even in the smaller 265-cubic inch versions, stock valve and port sizes are *not* adequate for the extraction of maximum power and torque. In fact, some very closely-controlled dyno checks on a 265-cubic inch hydroplane engine have conclusively proven that a good porting job will increase top end power by five bhp at 6000 RPM and slightly more in the 6500 to 7000 RPM range. The installation of 1/8-inch larger intake and exhaust valves, accompanied by necessary changes in the valve pockets to accommodate the larger valves, increased top end power by an additional 20 BHP at 6000 RPM as well as extending the torque and power peaking speeds. Torque below 3000 RPM dropped off slightly, between two and three percent, but the gain in maximum power was some 6 1/2-percent, or more than enough to offset the loss at low speeds. The gains in torque and power become greater as cylinder displacement is increased.

Thorough and competent modification of Chev cylinder heads is not cheap in terms of cash involved and this is one phase of modification that is certainly best left in the hands of real experts. While these changes may involve a certain hardship on the bank account, they cost nothing to the all-important factor of engine reliability. Furthermore, we cannot afford to shrug off a 6 1/2-percent or more increase in potential power.

If you must do the job yourself, for economic or other reasons, do not even attempt to change the basic shape of the stock Chev ports. Use stock Chev gaskets for templates and be very careful not to change the bellmouth shape at the entrance of the intake ports. Ports can be enlarged slightly to conform with the size and location of the gasket templates but the majority of the work, and that which is very particular indeed, must be done in the valve pockets directly beneath the seats and where the pockets merge with the ports. The lumps formed by the integral valve guides can be reduced in size but the height of the guides shouldn't be shortened more than 1/16-in. A 70-degree hand reamer, piloted in the guide bores, must be used to expand the valve pockets out to the new and larger seat diameters. This assures concentricity and uniformity in size, which is not obtainable by using a hand grinder. The pockets are then blended with the ports and polished.

Placement of the valve seats for larger valves is very critical in Chev heads because there isn't a great deal of room in which to correct mistakes. The combustion chamber surface around the seats must be "topped" with a flat stone or cutter, which is preferred over the more usual 15-degree angle. Seats must be very carefully ground until the major diameters are exactly the same size for all the intake seats and for all the exhaust seats. The standard seat angle of 45-degrees should be used because of improved sealing and slightly better gas flow characteristics, as compared to shallower seat angles. Seat width should be .060-in. for both intakes and exhausts.

Corrections to seat widths must be made with the flat "topping" cutter or the 70-degree piloted reamer.

The most common oversize valve head diameters for Chevs are 1⅞-inch intakes and 1⅝-inch exhausts, both of which are ⅛-inch larger than stock valves. The most economical oversize valves are those from a 1948 Cadillac flathead. The head diameters conform to those above and the stem diameter is nominally 11/32-in., the same as a Chev. However, the stems on the Cad valves are too long but it is a simple process to shorten them, regroove them for the stock Chev split valve locks and "O" ring oil seals and to flame harden the valve stem tips. While the Cad valves are inexpensive, they cannot be expected to last too long under extreme operating conditions. This can be detected by "guttering" of the seat faces caused by a combination of high cylinder temperatures and high valve spring loadings. We recently came across excellent intake and exhaust valves. Both intake and exhaust valves have Stellite seat faces and are available in 1 15/16 or 2-inch diameters for the intakes, 1⅝-inch diameter for the exhausts and both are machined, polished, ground to a 45-degree seat angle and are ready to install. The finished 1 15/16-inch intake valve weighs about the same as a stock Corvette valve and the finished exhaust weighs just a bit less.

Some experimental work has been done on Chevs, using the largest possible intake valve, or exhaust valve, within mechanical limitations. A 2-inch intake valve shows a slight power increase on the very top end of the power curve while exhaust valves larger than 1 11/16-inches did nothing anywhere in the speed range. The best compromise, from the standpoints of power and the necessity of regrinding seats and valves, comes with 1 15/16-inch diameter intakes and 1 11/16-inch diameter exhausts, as used in the Reventlow Scarab Chev engines. However, these valves are made specially for the Reventlow team and cost $10 each or $160 for a full set.

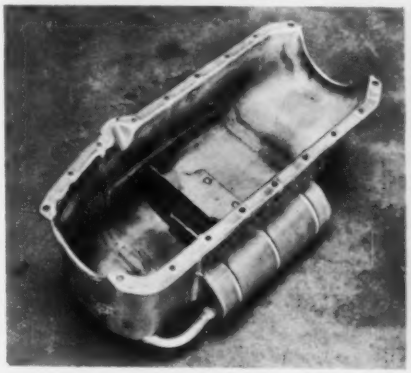
Each valve must be lapped to its respective seat. The lap marks furnish a visible guide to final valve machining. If the valve face extends above or below the actual ring of contact of the seat, it is in the way of gases and must be removed by machining, blending the cut into the valve head. The fillet radius at the juncture of stem and head must be machined and polished. Ditto for the top of the valve head. A small radius must be ground at the outer edge of the valve head to preclude the possibility of hot-spotting.

The combustion chambers must be machined to the edge of the head gasket around the valves. This is easily done with a milling cutter of the correct diameter piloted in the guide bores and is necessary for obtaining sufficient "breathing room" for the valves. The cuts must be blended into the combustion chamber wall with a hand grinder and the chamber must then be polished. Any sharp edges must barely be broken; large chamfers or radii are neither necessary nor desirable. The combustion chambers must now be very carefully measured for volume with a graduated beaker, as outlined last month.

The Chev engine is extremely sensitive to compression ratio; much more so than

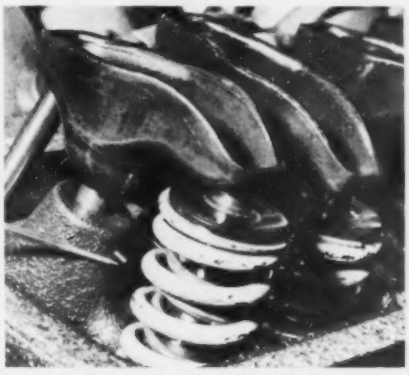
(Continued on page 84)

Nassau-winning engine nestles in tube chassis of Scarab sports car. Injector pump is gear driven off cam shaft.



Modified oil pan holds ten quarts, 4 more than stock Chev. part. Oil stays cool for long races.

Extra oil is accommodated in bulges, which are connected to main supply by tubes and holes.



Taper pin (above) driven into rocker stud boss prevents stud from lifting if valves are floated.

Modified combustion chamber (below) has walls at sides of valves relieved to edge of gasket.

Comments on Traffic Safety

by J. D. Williams

The writer is head of the Mathematics Division of the RAND Corporation — a nonprofit organization devoted to research on subjects affecting the national security and the public welfare. The present article is a personal appraisal and not the result of a RAND study. Portions of it have appeared previously in Fortune magazine.

PREFACE

An attempt is made to view automobile fatalities in context. The thesis set forth is that a substantial number of fatalities is an inevitable consequence of an operation of the magnitude and character of that conducted on our highways; that the present rate is not alarming when viewed against the value we derive from the automobile; that the rate can probably be reduced, but that it is important to use only such measures as do not simultaneously reduce its utility.

— THE BROAD POINT OF VIEW —

The topic of automobile accidents is invariably viewed as if through a microscope, which tends to emphasize a lot of local and sometimes gruesome details, but which does not give a useful general picture of the phenomenon. If you invariably examined cheese in this way, the nature of the little beasties would undoubtedly affect your attitude toward a healthful and tasty food. My technical knowledge of cheese is very weak, but I believe you cannot eliminate the beasties without eliminating the cheese. Worse, I infer that there is a *desirable* level of beasty activity. Similarly, I am sure that you cannot eliminate automobile accidents without eliminating the automobile. I am also almost sure that there is, in effect, a desirable level of automobile accidents, from some sufficiently broad point of view —desirable at least in the sense that it is a necessary concomitant of things of greater value to the society. Now every ounce of energy I have seen devoted to the subject has been aimed at reducing the present level. I should like to make the point that this may or may not be a useful aim. If the question is really open, then one should think about it pretty hard before attempting to change it.

There is a philosophical issue on values which should be mentioned briefly, though I am not well qualified to deal with it. We accept it as a creed that human life is priceless, and react involuntarily against anything which kills. I believe that in so doing we confuse the values of the individual and of the society. For instance, my life is, in a sense, priceless to me; there are probably things for which I'd give it up, but it isn't something I regard as part of my normal stock in trade. It is worth a lot to my family, but clearly it is less fundamental to them than to me. It is worth less to my associates than to my family, less to my community than to my associates, and so on. Finally, by the time we consider its value to our society, it is clearly sheer romanticism to say it is priceless. The fact is that the loss of my life would not produce an observable effect on the society, and this is literally true for most of us.

The automobile kills about 100 people a day, which seems terrible to the individual to whom death is the unique ultimate tragedy. But the society is more used to death and even needs it. Over 4,000 of of our citizens die every day—and over 10,000 are born every day. It is evident that the deaths are going to climb to meet the births despite safety campaigns, medical progress, and the like. Otherwise we will be standing on each other's heads, an exercise poorly suited to the old people who will dominate the society. So I doubt that the present total number of deaths, of which the automobile accounts for two or three per cent, is undesirably large for the well being of the society, and it may in fact be undesirably small. From these facts we at least gain the perspective that the automobile is not exterminating us, so we can afford to approach the problem calmly.

It isn't necessary to dismiss the 100 daily automobile deaths on demographic grounds as we have just done. By taking a little smaller view, one finds a different picture. To make the point, let us recall that a few years ago someone, under the stimulation of a hospital bed, conceived the idea of a national No Death Day (automobiles). To be against this would seem like being against Mother's Day, so men of good will everywhere supported it. They were duped into supporting a phony program. If the program were serious, we would just have to take the vehicles off the road for twenty-four hours. If we were to do that, we could have a No Death Day (automobiles), and it would be a day long remembered. On a normal day tens of thousands go to hospitals, but on this day ten of thousands would not. Doctors normally see hundreds of thousands of patients at home or office, but not this day. Firemen normally control thousands of fires, but not this day. Police normally control thousands of criminals and malefactors of all kinds, but not this day. And so on. In fact, we should be pretty lucky if the deaths in the population rose by only a thousand on No Death Day, and, if we were a little unlucky, they might look like the birth statistics. In fact the deaths associated with those 10,000 births alone might well exceed the normal automobile toll, instead of numbering about four. Of course the society normally creates over a billion dollars of wealth on an average day, but it would not produce much on this day. So each of the lives we saved would be paid for with the lives of perhaps ten others and perhaps ten million dollars.

I don't think that a No Death Day is a good idea, but the contemplation of one can give us some clues to the importance of the automobile to our society. It im-

mediately reveals that the automobile is a very important factor—perhaps the most important one—in producing the large gap between the numbers of births and deaths in the country. So the automobile has a large credit balance at the end of each day in precisely the coin we tend to worry about: lives. Incidentally, it is suggestive, isn't it, that the conspicuous life-saving operations absent in the No Death Day drama tend to be carried out at relatively high speeds and under dangerous traffic conditions.

Does the 100 deaths per day suggest that we are conducting the technical operation of mass transportation in a grossly careless manner? The general tone of public statements would certainly imply that this is so. Almost every person who has had access to and used mass media of communication to discuss traffic safety has contributed to the impression that the average American motorist is grossly careless and thoughtless, and even bent on homicide. I don't read the record that way. He is presently operating over 65 million vehicles, which he knows very little about, under conditions which are often difficult. Practically all of the people in the country from teen-age children to old men and women drive automobiles. As the years go by, fewer and fewer know anything technical about automobiles and their limitations. (Ed. note: A trend against which we struggle) The principal technical achievement of today's driver is that he has some rudimentary notions about how to aim the vehicle. The quantity of kinetic energy loose on our roads—taking into account the increased numbers, weights, and speeds—is perhaps ten times what it was a quarter of a century ago. It is a startling fact that the daily death rate has remained essentially constant at about 100 per day over this same long period. Whatever else this proves, it should scotch the canard that the driver is maniacal.

It also proves that the use and utility of the automobile can be greatly extended without having the death rate bound out of control. But just as one shouldn't blame the driver for the fact that the death rate is 100, you shouldn't give him credit for the fact that the present 100 represents breakage from a much more imposing operation than the one he was performing twenty-five years ago. I am also afraid that our overt efforts at control of this symptom of a large operation—psychological attacks, legal and police action, etc.—have also had little to do with it. The dominant factor has been that the physical equipment has been improved. *The most important improvement has been in the roads,* which have tended to get wider, straighter, and smoother. There have been improvements in the vehicles too, probably the most significant being those which have simplified the operation, thus permitting people with less knowledge and motor skills to participate successfully, but this is of secondary importance compared to the roads. Of course most of the roads are still marginal or worse.

The important fact about the automobile is not that it kills 100 people a day, but rather that it has been a crucial factor in the development of a fantastically complex and rich society. It has given us a new degree of personal mobility which we have exploited to develop the industrial complex, to provide ourselves with agreeable homes, a social life rich in choices, and a new degree of personal safety from the hazards of life. We may jeopardize our continued development of these things, and even what we have so far achieved, if we are only conscious of the disagreeable side effects, and if we seek to ameliorate these without regard to how we influence the main effects.

—THE VALUE OF SPEED—

I don't know whether the most important factor in the relationship of the automobile to our present society is psychological or physical. Both are very important. The physical factor of greatest significance is unquestionably speed—precisely the item we have the strongest instinct to tamper with in the interest of reducing accidents. For consider that, while we move great loads of goods and people by road, the vehicle most characteristic is one that contains one person bent on a personal mission. If speed were not *the critical factor,* this vehicle could be replaced completely and literally by a horse. The present city of Los Angeles could not exist if the citizen were limited to the speed of the horse. Neither could most of the present cities and social structure of the country. And the physical and social structure of the country may be almost frozen in its present attitude if we freeze the speed of the automobile.

I run some risk that you may conclude that I feel speed is the most important thing in life! Not so. Rather, I am trying to emphasize that it is one of the really crucial factors in our society. As with any of the crucial factors, it is promising to look for more. I cannot help but believe that we would manage better if we were conscious of this, rather than believing the exact contrary.

Even if one recognizes intellectually that speed is the essential physical element about traffic, there is an almost involuntary impulse immediately to add, "But not too much speed." Now no one could advocate "too much" speed—that's bad by definition—but the question of when does speed become too much is a very thorny question. I encounter situations where, in my opinion, 10 mph is too much, and others where 100 mph is not too much, and the variations in the situations are too great to be controlled very intelligently by legal fiat in advance. *The speed at which vehicles have in fact operated from time to time has been determined principally by the drivers,* who want very much to live, who have substantial personal investments in their hands (usually their largest or second largest), and who know that any injury they do to other persons or property will entail very unpleasant consequences. Their intelligence, judgment, and skill are not always a match for the situations, but in general they have managed to exploit the equipment available without undue damage. They generally drive faster than those who seek to control speed think they should, but as the interested parties on the spot their views are probably more nearly right than those of their critics. And while the typical driver couldn't formulate a good case for using as much speed as the situation warrants, he at least isn't burdened by the false doctrine that speed is the villain to be shunned at all costs. He *is* burdened by some feelings of guilt about the letter of the law, and he is subject to assault in the form of a fine or imprisonment if he is caught out of bounds even though the hazard be nil. This has been an unfortunate aspect of the development of the use of vehicles, but, like the death toll, tolerable. At least the utility of the automobile has managed to increase despite this brake. *It may become intolerable as the technical aspect of detection and control improve*—the widespread use of radar, for instance—intolerable in the sense that the utility of the vehicle may be lessened by strong enforcement of inappropriate, however well-intentioned, laws. Our laws tend to be aimed at the limitation of speed rather than at the promotion of traffic flow.

— SOME EFFECTS OF SPEED LIMITATION —

I mentioned that both physical and psychological factors seem to play large roles in the use of automobiles. Consider the phenomenon of new communities. As our mobility has increased, we have built more cities. It would not be astonishing to discover, after the fact, that we average a new city when we average an increase of one mile per hour in speed. However, the growth of new communities is too prolific to be accounted for directly from the savings in time represented by the increases in speed. There is an interplay with the psychology of the driver which can be seen by considering an example:

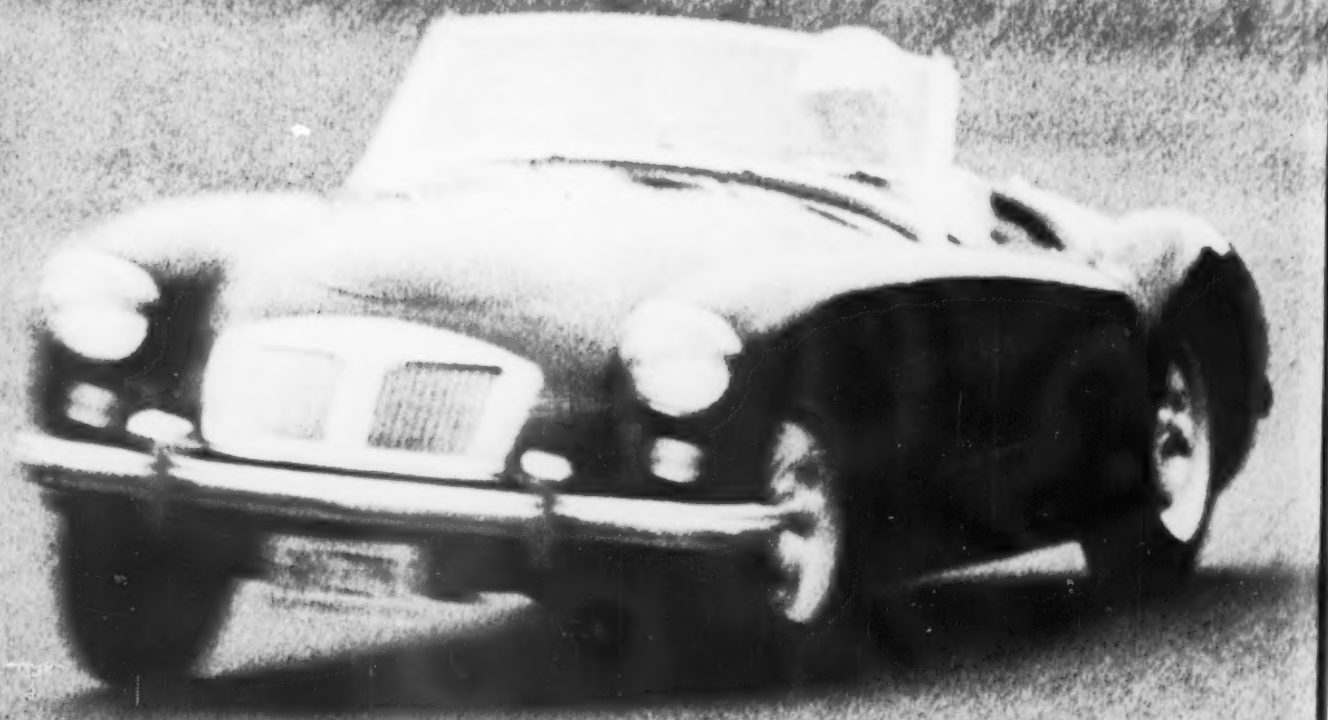
Suppose it is ten miles from a prospective homesite to work. It will require 15 minutes of travel time if the traveler can average 40 mph, or 20 minutes if he can average but 30 mph. This is the kind of example which anti-speed advocates love. It is obvious that the 5 minutes saved at 40 mph isn't worth much, directly. If the man earns five dollars an hour, it is apparently worth 42 cents, and he may expend rubber worth this much in one high-speed stop. The kinetic energy of the automobile increases as the square of the speed, so it is up by a factor of 16/9, an increase of almost 80%, which may be a fair measure of the increased hazard. So why bother with 40 mph? This analysis misses an essential point: *The driver is not motivated by those five minutes as minutes.* In fact he may not know within five minutes how

(Continued on page 74)

The potential was there — all it needed was coaxing. Here is how it was done.

SCI builds an MGA TWIN CAM for competition

by John Christy



LEFT — New type of piston is seen at right. Rings are closer together and there are no vent holes visible. In the SCI MG the top chrome ring was replaced with an iron ring similar to second and third units. RIGHT — Pins are palm-push fit at room temperature. Large ridges visible can be cut for balance.

SUBSCRIBERS and regular SCI readers who were with us for the October and December, 1958, issues will remember a certain black MG Twin Cam, New York license number 6N 3298. This particular MG was one of the first Twin Cam cars off the boat and it had, from the moment of its landing, anything but a life of tender loving care.

For the October issue it was tested as delivered. The results, while good were not terribly impressive. Performance was on the order of that of a Stage 4 MGA but with more docility than is found in the stage-tuned rocker box car. In short, a good car but no class F winner.

In the December issue we told how we attempted to improve the raceability of the car without going into the engine. In brief we stiffened up the suspension in front, changed the Dunlop Roadspeed tires for Dunlop R-3 racing rubber and removed about 80 of the 150-plus legally removable pounds of weight. Lap times around the Lime Rock Park course dropped from 1:20 to 1:18.5. For the earlier October issue runs we had already experimented with gears, dropping the original 4.3 to 1 rear end in favor of 4.55 to 1 final drive gears, one of three standard sets available with the car. Also installed at that time was the optional close-ratio gearbox with ratios of 2.45, 1.62, 1.27 and 1.00 to 1 respectively in first, second, third and fourth. As we said, all these little things added up to about two seconds worth of lap time. At this point we could pursue this tack no further without actual body and chassis modifications that would have nullified the "production" status of the automobile.

The obvious succeeding step was to check out the engine. There isn't a true production power plant in the world that is perfect — the exigencies of a production line won't permit the hand fitting and careful tool setting that must be used if the final product is to fit the designers plans perfectly in all respects. For that matter, many racing enignes are built up and then carefully torn down and reassembled before ever appearing on the race course.

It was obvious by this time that this particular MG was no exception. In the first place it had been well and truly pushed from the start and it was now showing the strain of many fast laps and acceleration runs. Power was very obviously down, oil consumption was up, water temperature stayed high, it pinged piteously at any but the lowest ignition setting and it "ran on" like a berserk diesel. It would still turn 7000 revs without clattering but there just didn't seem to be any power coming through the flywheel. It didn't have the willingness that two cams, nearly 10 to 1 compression and 1600 cc's would lead one to believe was there. In short, it was a very unhappy, unhealthy engine.

The one problem here was that the car was not the property of SCI. It belonged to Hambro Automotive Corporation, the importers of all BMC products in the U.S. A call to Hambro management elicited the necessary permission to delve into the engine with two provisions. First the car must remain a legal production machine and second, that the results must not be listed as official recommendations of either Hambro or of the MG Car Company. The first provision was already part of the plan and the second was absolutely standard procedure in any case.

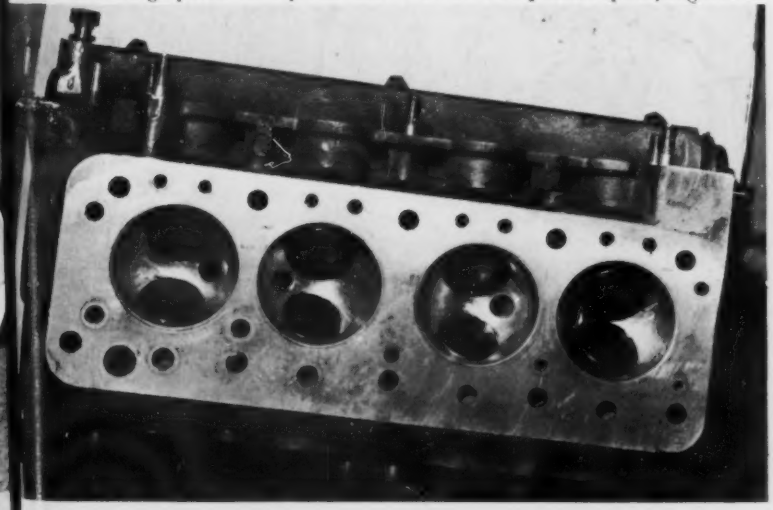
The car was then taken to Imported and Domestic Service, Ridgefield, Connecticut where master mechanic Joe Virag makes good machinery better. Virag had already reworked a Sprite for SCI with considerable success so we were familiar with his brand of craftsmanship. DOHC equipment is also a specialty of the house. The obvious first move was to pull the engine, a task more easily talked about than accomplished. We were to learn many things about MG's new road-eater and the engine pulling lesson was the first. The Twin Cam engine is not only wider than its rocker-arm cousin across the head, but there is considerably more girth at the bottom. The result was that the increased size of the cast alloy sump hits the front cross member when an attempt is made to remove the engine in the normal way. Either one of two alternate procedures must be used; the gearbox can be unshipped from its mounts and slid back carefully, or the sump can be removed. Of the two, the sump removal tends to be more tedious but, in the long run, easier. In any case one doesn't just unbolt the engine and lift. The long, tuned exhaust system must also be dismounted in either instance.

Next, the engine was mounted on an engine stand and all manifolding was removed as were the two angular cam covers. Here the dissassembly was halted and a degree wheel was mounted on the crank nose. Every cam lobe and every valve was then checked out.

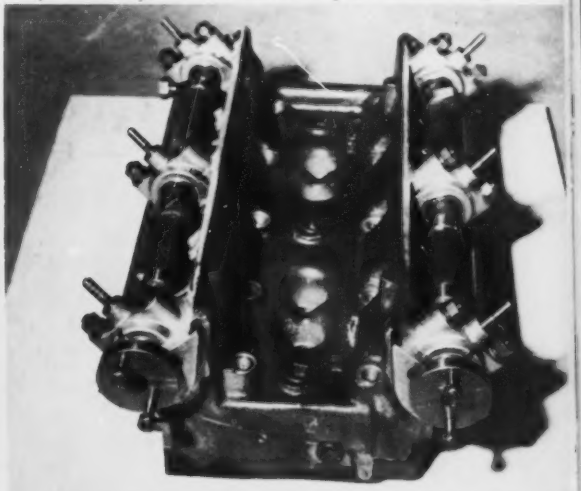
At this point and because of what follows it is only fair to point out that this particular car was one of the first 40 produced in a pilot run. The engine was not put together at Abingdon but was run through the production line at BMC's huge Engines Branch plant. The pilot run, we understand was a check to see if it was feasible to produce the Twin Cam in quantity on a production line.

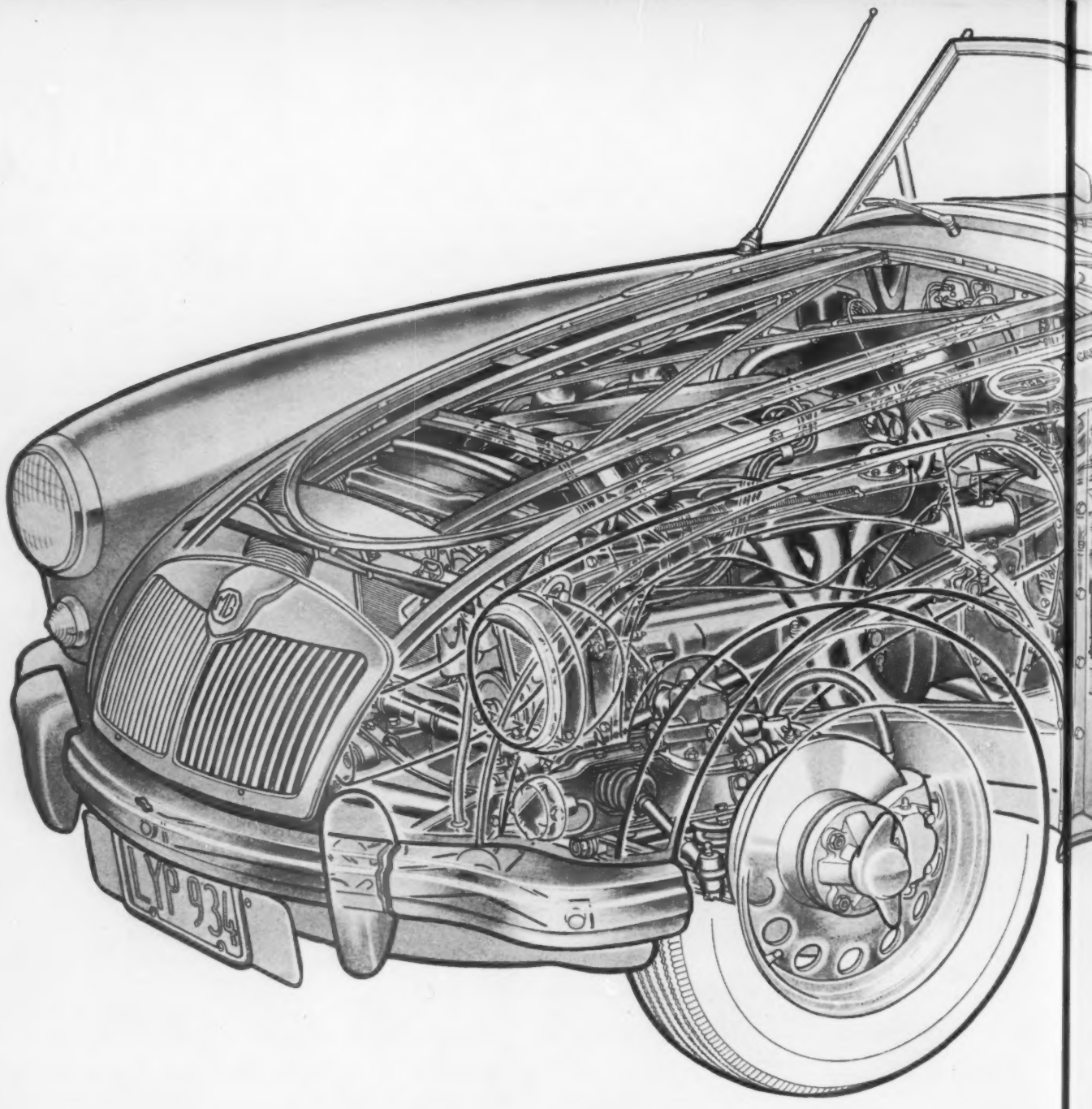
But back to the valve check-out. Correct valve clearances are specified as .018 to .019 of an inch. The clearances on this particular pilot model were from .016 on

Combustion chambers were relieved of all sharp edges left in production machining operations. Special attention must be paid to sparkplug holes.



Head assembly from the front shows the straightforward layout. Cams are clamped in 3 bearings.





one valve to .021 on another and all points in between for the rest. The cam timing also gave a clue to why we hadn't been getting the power we had expected. The intake cam checked out at four degrees late and the exhaust cam proved to be seven degrees early. In other words the intake valves were opening and closing later in the cycle and the exhaust valves were operating much too soon. The net result was that most of the fire was going out the exhaust instead of pushing the pistons down like it should.

Lesson number two. If you have one of the early series Twin Cam units and are not getting the wallop you should, set the cams by use of a degree wheel and depending on the camshaft numbers use the following figures:

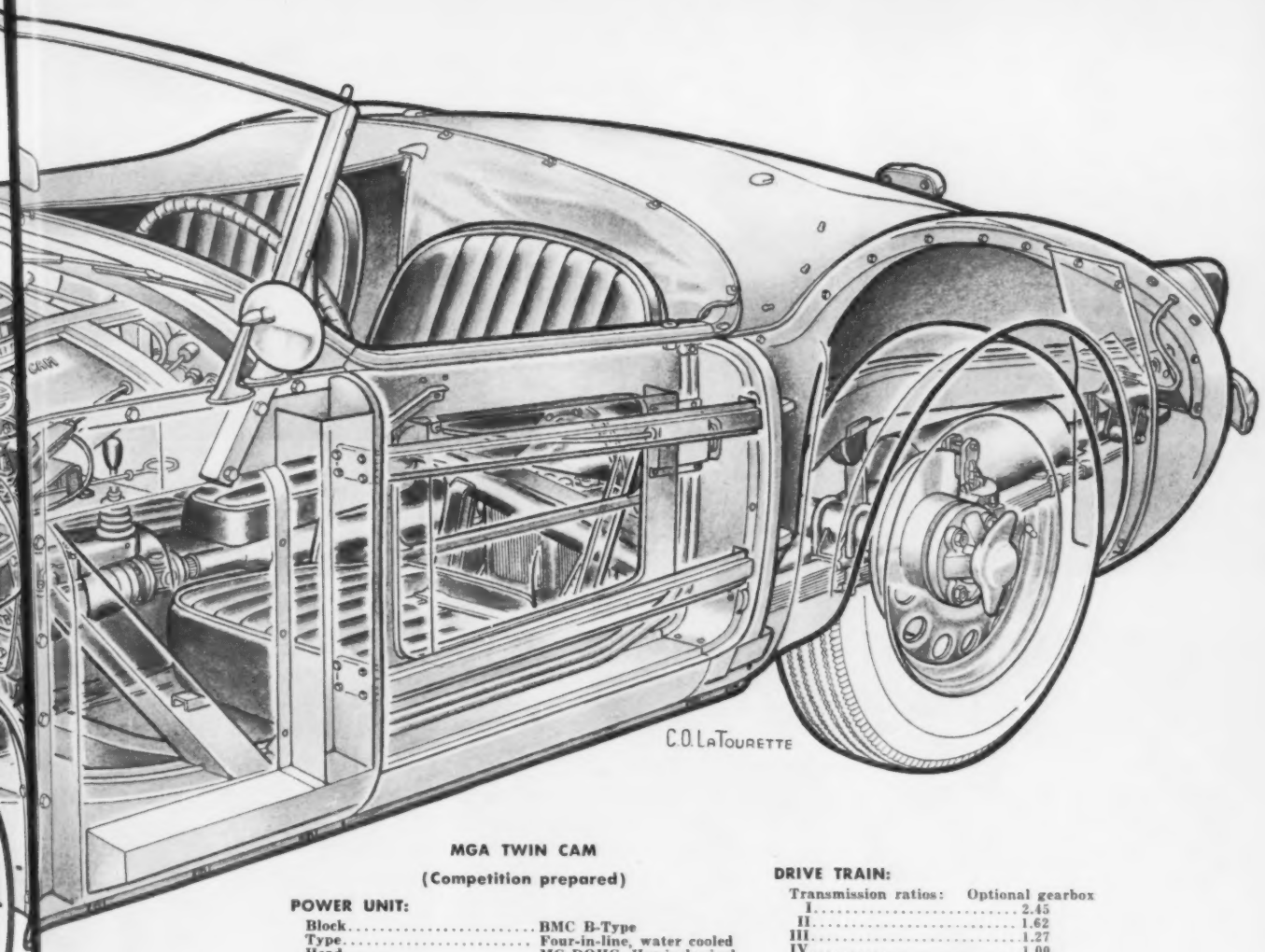
Intake opens 20 degrees BTDC
Intake closes 50 degrees ABDC
Exhaust opens 50 degrees BBDC
Exhaust closes 20 degrees ATDC

In addition to the above, the first production run Twin Cam engines had cams which degree out at 280 degrees with the same lift and slightly milder acceleration than the 250° units. Check yours with a dial indicator and degree wheel. If you have the 280° cams the timing is:

Intake opens:	35 degrees BTDC
Intake closes:	65 degrees ABDC
Exhaust opens:	65 degrees BBDC
Exhaust closes:	35 degrees ATDC

After, and only after, all the valve data was gathered, dismantling proceeded by the book. The cam sprockets were unbolted and slid forward into their locks and the cams lifted. Piece by piece in strict accordance with the factory manual the engine came apart.

The bearings, both rods and mains, were in fair shape, all things considered, but were worn enough to be replaced and so set aside. The crank was absolutely unscored and brightly clean which attests to the quality of material that goes into the Twin Cam when the pounding this engine took is remembered. The big, sturdy rods were checked and proved unflawed and in perfect alignment. This last item is important. In rebuilding any engine, especially if competition is the goal, any and



MGA TWIN CAM

(Competition prepared)

POWER UNIT:

Block	BMC B-Type
Type	Four-in-line, water cooled
Head	MG DOHC, Hemispherical chambers
Chamber volume	86.6 cc
Valve arrangement	2 per cylinder, 90° inclination
Compression ratio	9.9 to 1
Bore	2.995 ins
Stroke	3.5 ins
Valve seat angle	45° intake and exhaust
Valve size	1.59 ins intake, 1.44 ins exh.
Cams	250° duration (280° early series) AHH580
Lift	.375
Tappets	Cup-type, shim adjusted
Connecting rods	MG, full-floating wrist pins
Pistons	Mowog, aluminum, solid skirt
Total clearance	.0075
Rings	3 iron compression, 1 oil
Intake manifold	Log type, 2 inlet, 4 outlet
Carburetion	S.U. Type H-6 1¾ in
Needles	OA-6
Jets	.10 (2.54 mm)
Flywheel	MG, (steel)

DRIVE TRAIN:

Transmission ratios:	Optional gearbox
I	2.45
II	1.62
III	1.27
IV	1.00
Final drive	4.55

RUNNING GEAR:

Shock absorbers	Stock, lever & piston, Castrol R oil
Front suspension	Stock, coil springs
Rear suspension	Semi-elliptic leaf springs
Brakes	Dunlop quick-change disc, competition pads
Wheels	Steel disc, knock-off
Tires	Dunlop R-3 (Alternate R-5)

GENERAL:

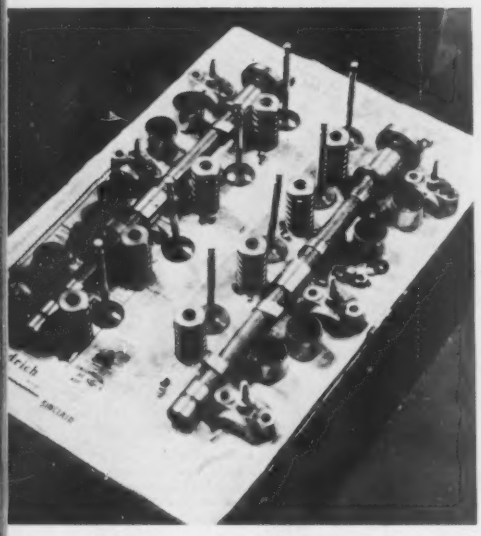
Length	156 ins
Width	58 ins
Height	50 ins
Weight	2000 lbs without top, windshield, bumpers, rugs and heater
Weight distribution F/R	51/49

all rods should be checked for flaws and set in perfect alignment. One bad rod can wipe out the whole engine in less time than it takes to tell about it, and it can do it with no warning whatsoever.

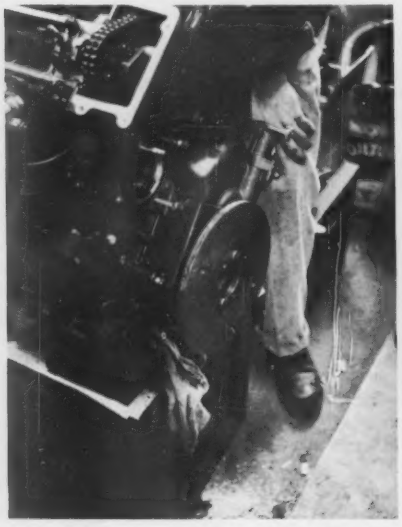
It was when we came to the pistons that we discovered just what had been going on inside this particular MG. The standard minimum clearance for pistons in the BMC B-Type engine block is .0035 of an inch. This is all very well in a passenger car engine that is to be broken in over thousands of miles and is meant to give years of service after that break-in. It is just sufficient clearance, tight but all right with *split skirt pistons* such as those used in the ordinary B-Type engine. But the Twin Cam is not an ordinary B-Type—the block is the same casting but that is about as far as it goes. The Twin Cam is equipped with sturdy *solid* skirt racing type pistons which have an expansion factor much greater than that of the split skirt type in which the split or slot takes up the swelling when the piston is hot. To further complicate matters the car had been run in with Castrol R #40. The combination of what amounted to virtually nil clearance on the hot pistons and the heavy racing oil left no room for oil on the cylinder walls. The result was a set of four badly scuffed racing pistons and, worse, a four-thousandths taper in the bore. The hard chrome top ring had acted like a cutting tool when pressed by the expanding piston on the oil-less wall and had chewed the upper bore out by over .004 of an inch. The wonder was that the tops hadn't been pulled right off the pistons. Strong stuff, these Mowog racing slugs.

The wear was too great to be cleaned out with a simple honing. The decision had to be made and it was. Virag bored the cylinders out an additional .020 of an inch and ordered a set of pistons for that oversize. Two cuts were made for each cylinder. First a rough cut to plus .019 was made and then a finish cut to bring the bore out .0085 of an inch further completed that particular hole. Between each cut for each cylinder the tools were dressed so that separate bores were absolutely accurate to the ability of the micrometer to measure. A fast hone in a diamond pattern finished the job. The new pistons are of the latest type with the oil vents behind

LEFT — Joe Virag checks out the valves with a dial indicator prior to disassembly of the engine. All timing was carefully checked during dismantling and assembly. ABOVE — Ports on exhaust side are huge and virtually straight through. No enlargement necessary but all ports were matched to manifolds and equalized in size.



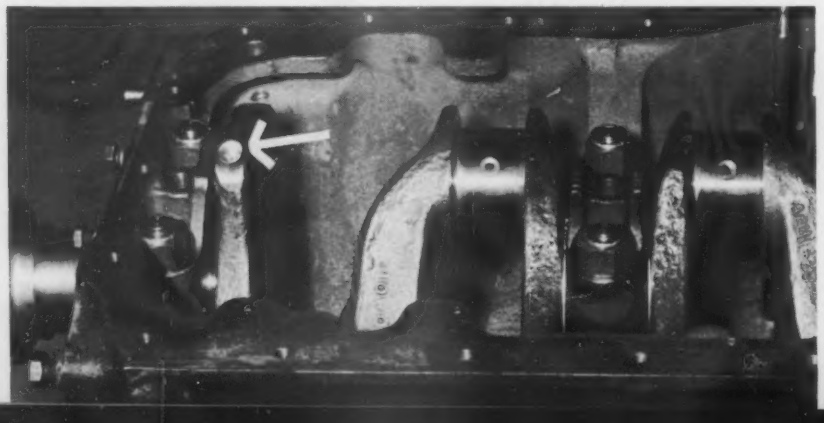
Valve, cam assembly broken down and laid out with all components separated.



A degree wheel is a must if accurate valve timing is to be achieved on MG.

Dunlop racing tires accounted for almost a full second lap-time in tests.

BELOW — Dynamic balance tests of the sturdy crankshaft showed only one small balance drilling was needed (arrow). The same applied to flywheel and clutch. RIGHT — Short stiff rods are similar to those in Stage 4 MGA fitted with solid skirt pistons. Large bosses on caps and little end may be ground for balance.



the oil ring only and none in the piston wall. The rings are also spaced closer together on these later replacements for a better seal. The pistons were measured and found to be exactly on size and the bores — as outlined above — were then honed out carefully to give a skirt to wall clearance of .007 instead of the original .0035 of an inch. When fitted to the bore without rings the new pistons dropped through freely but with no sign of cocking or wobble — a perfect fit.

Next came the balancing act.

Each rod, piston and the bearings to go with that particular rod were carefully weighed and balanced against each other. The weights were marked down and the crank, flywheel and new clutch assembly were sent out for dynamic balancing. Only one small balance hole had to be drilled in each item but they *did* need the drilling. This balancing comes easy on the Twin Cam — or any MGA for that matter. The rods have large, meaty sections at the lower end of the caps and on the little ends so they can be slightly ground to gain the necessary end-for-end and overall balance. The pistons also have internal ridges at the bottom of the skirts from which metal can be carved if found necessary. In all cases it is vital that the bearings to be used in the final assembly be clamped in the rods when the weighing is done. It is also a good idea at this point to tamp the locating tang on each bearing shell into its recess in the rod big-end. These are *not* full floating bearings and must be well and securely located. The rods in the Twin Cam are virtually the same as the Stage Four rods for the MGA in that the wrist pins are of the full floating, push-fit type rather than the clamped pins found in the standard MGA and other B-Type engine units. These wrist-pins should be (and were in our case) an easy palm-push fit in both the rod and the piston at about 70 degree temperature, Fahrenheit. Location is by circlips in the piston at either end of the pin.

The crank, rods, pistons with rings and flywheel were then mounted in the bare block and cinched down to the various torque readings specified in the manual. A solid spin of the flywheel produced nearly six complete revolutions with no clicking noises. Although we had been afraid at first that there might be some piston noise with a cold engine due to the large clearances we had allowed there was none when the engine was later fired up. Thus while the clearances we had used were somewhat larger than those specified in the manual they were still within the range of silent running even using the Castrol R-20 with which the engine is being run-in.

During the wait for the necessary block components and the balancing operation the head and valves were given close attention. The inlet manifold showed the usual bumps, lumps and casting ridges found in any production casting and was cleaned up without hogging immediately, a process made easy by the short, very wide passages. When bolted to the head for checking it was found that the outlets at the mating surface were offset downward in relation to the inlet ports in the head so the ports were scribed and tapered to a perfect match. On other engines this offset could be up, down, right or left or even non-existent in some cases. In these cases not too much worry need result but if the offset is downward as in our case there is a problem since there is not too much metal in the bottom lip of the port. The angularity of the taper must be watched and controlled to avoid weakening this lower lip. The ports in the Twin Cam need not and should not be enlarged but they must be cleaned and matched one against the other. Some attempt at equalization is made at the factory but the speed of production line prevents really accurate port equalizing. The result is that in the non-machined portions no two ports are exactly alike as they should be if the potential inherent in the MG is to be realized.

Other than the port matching and cleaning the major work in the head is the relief of hot spots in the form of sharp edges left by machining and doming operations. The major source of trouble and the one that probably caused the running-on and preignition in our engine was the sparkplug area. Apparently the dome cutting was done after the plug inlet was drilled and threaded and the resulting knife edges made ideal glow points. Such faults as these are not necessarily the private property of MG Twin Cams but are found in many other marques as well and cause much of the running-on character that is usually associated with four cylinder engines tending to cause the mistaken impression that running on and preignition is one of the characteristics of the four-barrel. All such edges and the edges of the combustion chamber as well were rounded off in our Twin Cam. Where it once dingled, pinged and chugged on with the switch off it now runs smoothly and quietly under load and shuts off instantly with the key. Combustion now takes place when the sparkplug tells it to and not when the fuel and air are shoved up against some evilly glowing piece of metal.

The valves, which were found to be in good shape were lapped into place after the valve seats had been refaced and slightly narrowed and new guides installed, the old ones being just worn enough to warrant replacement. Each spring, both inner and outer, was checked against the others and all found to be within half a pound of each other fully compressed. After this the assemblies were installed at exactly the .018 of an inch clearance the book calls for.

Now came the tedious part. Virag is a nut on absolutely accurate valve timing. With his Offenhauser the job is made simpler since the cams are gear-driven but with most sports cars chains are used in the interests of silence and economy. The MG Twin Cam falls into this latter category and the chain is long indeed. The major problem is to keep enough tension on the chain so that it doesn't slip off the lower sprocket while the adjustments are made at the cam sprockets. Once the tensioner is backed all the way off or removed the chain is quite likely to skip a tooth and anything from three degrees on up can be lost. The main points to watch are contacts at each cam sprocket and at the half-speed shaft and the tension in between these points. The workshop manual gives the adjustment procedure in great detail and it would be repetitious to cover it here since the use of this manual is an absolute must for anyone delving into the innards of the Twin Cam. You can bumble through a rocker-head and make it run but the Twin Cam is not a rockerbox. Either a thorough course of instruction or meticulous use of the book and succeeding bulletins are as necessary as proper tools.

Next came the outside accessories. When the engine was first removed it was discovered that the generator bracket had cracked at the generator swivel point. The original bracket is made of bent flat stock and this form of breakage is not unique to the Twin Cam but is fairly common. A reinforcement plate was made, doubling the thickness of the bracket. The generator was then mounted and shim washers placed between the bracket and the mounting flanges on the generator so that tightening would not displace or strain either the flanges or the bracket.

The original carburetors, H-6, 1¾ inch S.U. instruments, were used in their standard trim with OA6 needles and 2.54 millimeter main jets. No richening was deemed necessary. The ignition distributor was equipped with new points, the springs of which have been changed metallurgically since the earlier models since it was found that the former metal tended to fatigue. The distributor on the Twin Cam is rather hard to get at, being down on the left side of the engine so the rubbing blocks on the points were run in for several hours on an ignition strobe machine. This imparts a high, hard polish and retards the tendency for these blocks to wear, which causes the points to open with a progressively shorter gap as time goes on.

What does all this do?

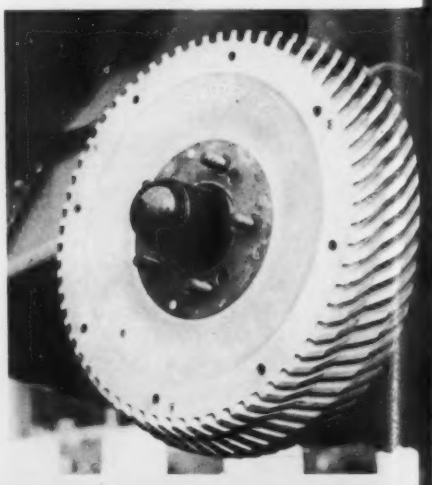
We've indicated that we have a smooth, virtually trouble-free engine. It also goes. As might be expected torque at the bottom end is low. At anything under about 3000 rpm the push is just not there. As the tach needle swings past 3500 rpm, though, you begin to realize just what this engine can do—it appears as though someone added two more cylinders. At one point, motoring happily along at 3600 rpm in third gear we saw a clear stretch of road ahead. Half a mile up was another car also motoring along at about 40 mph. A quarter of a mile ahead of him was a bend. Feeling that he'd be well around the bend before we got there we poked the throttle. We were on top of him, backing off and dragging brakes, before he got halfway to the curve!

New 2000 Spider supplements smaller Giulietta in the Alfa line. Shield-shaped grille has been retained on the bigger model along with simple body lines.

SCI DRIVER'S REPORT:

ALFA ROMEO 2000 SPIDER

Top up shot proves that Italians have a knack for turning out well fitting, smooth soft tops. The best feature of all Alfa cars are their brakes. One look at a Spider's brake drum (below) shows that the Alfa's stopping qualities are the result of quite a bit of thought on the part of the engineering department.



WE FIRST SAW the Alfa Spider at Turin during last year's automobile show; ever since we've been making a nuisance out of ourselves at the Alfa-Romeo factory in trying to get them to turn one loose. The object in question is the Touring-bodied Alfa-Romeo 2000 Spider, the 2 place "sporty car" version of their 2000 sedan. Due to various and sundry development details that had to be ironed out in the first models, we didn't get the opportunity to try the new Spider until several months later, having it at our disposal for several hours one morning.

As time was limited, and weather conditions not at all favorable, we decided to drive the car as much as possible in the time allotted. This of course allowed us to take only limited performance data.

The Spider is a 2 to 3 place roadster similar in basic elements to the Giulietta Spider. Yet it is completely different in temperament and personality, as we quickly found out. Driving out to Monza through the Milan morning rush hour gave us our first impressions. It's possible to carry three up (the Alfa factory man was crumpled up behind the seats) if need be, but like most sports cars the third seat is not really a seat at all but a state of moderate discomfort. Threading our way through busses, bicycles and motor scooters, we found the Alfa 2-liter to be as smooth and flexible as its sedan stable mate. The 1975 cc twin cam engine has been fitted with twin side-draft Solex carburetors and if we can believe the factory this has been the only major modification used to give it ten more horsepower than the normal 2000. The driving position is good. Twin bucket seats sit low to the floor and have slightly raised sides to keep the occupants from sliding around. Between the seats and up on the tunnel is the large gear lever for the five-speed box—yes, five speeds and all synchronized. This was our first experience with a five-speed box and we were really pleased with its feel and ease of manipulation. Instruments are clustered directly in front of the driver, the drum-type speedo found on the 2000 sedan being replaced on the Spider by a conventional and more exact circular instrument. Water and oil temperature gauges are fitted as well as fuel supply. Glove compartment and grab rail are opposite the passenger. Clutch and brake pedals are well spaced with the fly-off hand brake situated alongside the driver's right leg. The gear box lever dominates the cockpit, however. The throw of this lever is not terribly long, the pattern being the conventional H with fifth gear found high and to the right, fourth being in its normal position at the bottom right hand corner of the H. Reverse is selected by pushing down on the knob on top of the shift lever and at the same time shoving it to the right and down. The only hitch in the box that we could find was that in the beginning we had a tendency to find fifth when we meant to engage third. If the car were destined for competition (which it's not) we'd insist on the factory installing a safety catch. Otherwise the five speed box is sweetly smooth and obviously quite rugged.

In the ten minutes it took to drive to Monza from downtown Milan, we felt we

A wet day at the Monza Autodrome (above) made it pleasantly clear that the new Alfa sticks like glue. Instruments are set high—just below driver's line of vision.

had gotten to know the car reasonably well. Monza is indeed a fast circuit and as we started out on our first lap we noted with considerable respect the many twisting black marks on the exit of the Curva Grande. With a slightly damp track under our wheels, we took it cautiously the first few times around, allowing the car to slide gently on its Cinturatos. The first impression from the Spider was one of better balance than that of the sedan. Whistling down the main straight we found fifth gear just passing the middle of the pits and by the end of the straight the rev counter was needling close to 6000 rpm, the speedo creeping up to an indicated 108 mph. The Curva Grande we took in fourth in very safe fashion at about 85 mph. Holding the car close in to the apex of the Curva Grande, our photographer remarked about the car's quite restrained amount of lean; he heard us coming via a high whistle that the Alfa 2000 Spider has when being thrashed along. We caught fifth gear very briefly before Lesmon, then shifted down and braked hard for the famous bend, an easy task since anchors on the 2-liter are even more potent than on the sedan. The bi-metal drums are bigger than those found on the Giulietta and equally as fade-proof. We repeatedly tried to destroy them going into Lesmo and into the South Curve—the only two places where you really use brakes at Monza, and just didn't detect any fade.

Lesmo curve is taken in two parts; we found our limit at about 60 mph in third gear, the rev counter riding the 5000 mark. The track was shaded here and still a bit damp from the morning mists and as we felt the tail slide out as the power came on, only the slightest correction on the wheel was necessary to put the car straight. Well balanced car—easily held in a drift, these two descriptions sum up the handling.

It's a safe-feeling car and gives a driver confidence at what Denis Jenkinson would call eight-tenths. Accelerating hard out of the second half of Lesmo we engaged fifth speed in the fast descent underneath the North banking; the road circuit then flies out into the approach to the flat-out Ascari curve. In a Formula I car the speeds approach 150, for this is the fastest part of the course. We whistled through in fifth, the revs at about five-five. You then rush down the back straight for a good half mile until warning signs every 200 meters signify the approach to the South Curve. We left our braking late, popped from 5th into 4th thanks to a spring mechanism allowing the lever to zip smoothly out and in position for the throw into 4th. Braking really hard now, we caught third, the revs sailing up to the 6000 mark on the overrun. South Curve is taken in one complete line; you use all of the road, and as you come out, drift as wide as possible. Unfolding in front of you, then, is the main pit straight and you aim your car for the seemingly tiny slot that is the continuation of the road circuit.

We completed about 10 laps before it was time to pull in and take a few photographs. Interestingly enough we had found a measured quarter mile on the surface of the Monza track — the paint rather faded, but nevertheless, there it was and after several trials we came up with a mean time of 18.1 seconds. Crossing the end of the quarter, the speedo was reading 130 kph; this works out to exactly 76 mph taking into consideration the known speedo error. In the remaining time we did several 0-60 runs under the eyes of the Alfa factory representative. This worked out to 12.3 seconds on the damp track. Due to the presence of ice on the high speed banked circuit we were unable to try for a maximum speed. The factory feels that the 2000 Spider is capable of 190 kph or 118 mph. In our opinion this does not seem too far off, provided it's given at least a mile and a half run.

We were impressed with the lack of extraneous noise with the top in place. Sealing from wind and rain is not bad, and the canvas top is easily put up or down. It is expected that this 2-liter will also be available with detachable hard top. Criticism of the car stems from what we feel is a lack of fine detail finish that one would expect in a custom-bodied Italian sports car that will sell for over $5000. In fairness to Alfa-Romeo, our test car was obviously #1 of a production series and improvements should be expected on future units. The luggage compartment is large and contains the wide mouthed fuel filler.

The Alfa 2000 Spider was not designed to be driven in 2-liter competition, for its curb weight of over 2600 lbs puts it at a rather serious disadvantage. However, performance of engine, gear box, brakes, and running gear is excellent — all that can be asked of such a machine. Alfa engineers have done their best with the power unit available.

(Continued on page 92)

Alfa sedan (above left) was designed to hustle well-to-do Latin business men around Italy's tortuous road net. Workout (above) on Monza Autodrome showed that car was well up to its job.

SCI DRIVER'S REPORT: ALFA ROMEO 2000 SEDAN

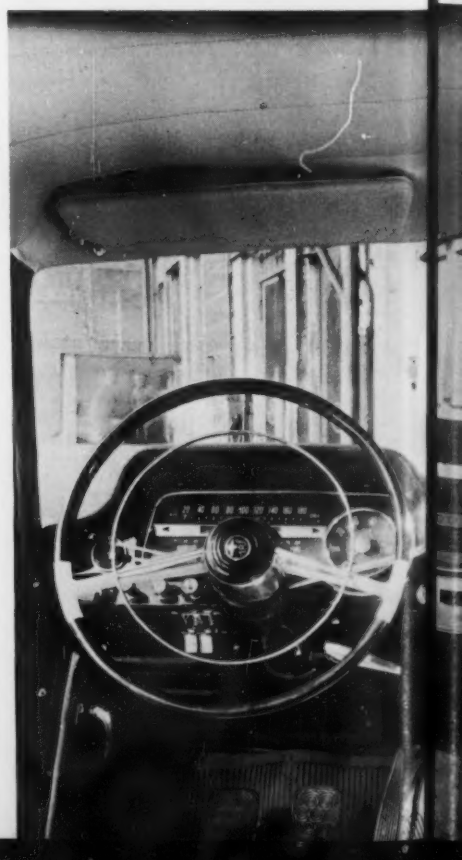
ALFA-ROMEO have a long tradition for building "race-bred" automobiles. In fact, sporting blood has run in the veins of practically every Alfa built. So strong is this connection between the Milan firm and motor racing in the public mind (even now, several years after Alfa quit factory participation in Formula racing) that whenever an average "not-too-clued-up" European encounters an exciting red car, whether it be a child's pedal machine, or a red coupe charging up the Stelvio, "it's an Alfa". South of the Alps, this name ranks on a par with Ferrari whenever the conversation turns to exciting cars. Up north, however, Alfa-Romeo sales have lagged due to the fact that most non-Italians are of the opinion that everything emanating from Milan and Turin are race cars or reasonable facsimiles thereof, and it's only been in the last year or so that the Giulietta series has begun seriously to infiltrate non-Latin territories.

This is due in part to the success of the Alfa Giulietta and the following the car has won through its numerous competition successes. The 1300 Berlina TI is likewise catching on and in the next five years, Alfa sales are going to get a real boost thanks to two recent commercial agreements that Milan has negotiated with Renault in France and NSU in Germany. Distribution and production rights have been exchanged, with Alfa-Romeo pushing Dauphines in Italy while the Billancourt establishment markets the Alfa program. Germany is ripe as they have always admired things Italian and with the NSU dealer network already set up, there are bound to be more Alfas on the Autobahnen in the next few years. These commercial exchanges have been encouraged by the European Common Market and already lower retail prices have been established on many cars.

But with their production program ranging all the way from an 8-passenger bus to sports cars, Alfa have attempted to fill a needed gap in their line with the new 2000—the Alfa 2-liter four-door sedan which has replaced the well-worn 1900 and 1900 TI.

We doubt that it will become as well-known in rallies and in the competition world as its predecessor, the 1900, in spite of the fact that the 2000 does have many sporting characteristics. But it is presented to the buying public as a representative upper bracket passenger automobile on the same level as such glamorous European cars as the Lancia Flaminia and the Mercedes 220SE. Criteria for such automobiles are most un-Alfa like: spaciousness, a high degree of silence and a reasonable degree of luxury. The Alfa 2000 has a limited number of these characteristics, falling down on the silence end. And in spite of the engineer's attempts to build an Italian Mercedes 220, they have not made it completely uninteresting. First of all, the engine:

Alfa would have liked nothing better



than to design a completely new engine to replace the 1975 cc (120.4 cu. ins.) four-cylinder handed down from the Tipo 1900, but financial dictates said no; this has resulted in a thorough dust-off and clean up of the twin-cam job and it now puts out 100 hp in place of the former 90. In the Touring bodied 2000 Spider, the engine fitted out with twin side draft Solexes is rated at 110 hp. It's a great engine, but out of character in the four-door sedan, for the simple reason that at anything over 4000 rpm you know it is being twisted. At high speeds, engine and wind noise are quite excessive. Criticism stops here, for despite it being a four-banger, the twin cam Alfa 2-liter is as flexible and smooth as an American V-8. Power comes in hard at 4000 rpm, the red line on the rev counter beginning at 5500 and continuing up to six. We took it up to six for acceleration figures and the engine sounded solid and unburstable even at that rev limit. Despite rather unfavorable conditions, we consistently reached 60 mph (corrected) in well under 15 seconds and completed the quarter-mile in just a shade under 20.

The Alfa 2000 is a well-styled, well-thought out automobile, extremely enjoyable to drive fast, thanks to two things, the five speed all-synchro gear box, and the typically large Alfa, fade-free drum brakes. Road holding and handling are reminiscent of the Giulietta TI Berlina which we tested a while back, while styling is definitely not. Originality comes hard these days but Alfa has managed to design an attractive automobile with a lot of glass area, modest fins enclosing the rear lights and while still using the available space to the maximum. Interior and exterior colors, dash board styling, the large windshield and seemingly very generous door windows, all contribute to an aura of modern European elegance. The horizontal drum-type speedometer is supplemented by a large rev counter, a feature that just could not be omitted, even on this high-class four door. Small controls include a two speed wiper switch, fog lights, hand throttle, choke, and heater controls. The heater is, if anything, too efficient and even includes a defroster for the rear window. The high, comfortable bench-type front seat reclines almost flat while in the rear an arm rest is fitted in the middle of the back seat. An excellent small feature is the passenger's grab rail above his head fitted into the roof of the car right over the door. Very handy when the driver begins to take on the mantle of Nuvolari. The Alfa 2000 is very American — and yet at the same time very European.

Most of our test miles were put on over the winding roads of the French Maritime Alps where the ride of the 2000 proved firm, with the sturdy suspension imparting a taut yet a smooth feeling to the occupants. As opposite to the ride of an American car as night is to day. On a twisty road the car soon fills the driver with confidence, for the excellent vision and the ability to use all five excellent ratios via a very satisfactory column gear change make mountain driving a real pleasure. Fifth speed is, in effect, an overdrive, and is used accordingly; flat out, it will drop engine revs almost a thousand when engaged. Second and third gear can be used almost all of the time in traffic, with first gear starts not 100% necessary. Steering is on the hard side, harder than found on the Giulietta series of automobiles, while handling is very reminiscent of the Giulietta Berlina TI. Pushed hard through a corner, the Alfa 2000 initially understeers and we found it difficult to break the rear end away due to the weight distribution and wheelbase factors. Suspension lay-out, both front and rear is very similar to the Giulietta automobile, with components being slightly bigger.

Little need be said about the brakes. We were astonished when we removed a wheel and looked at the huge, finned, bi-metal drums. Total braking surface on the Alfa 2000 is 264 sq. ins. A production Chevrolet has 157 sq. ins. and the Mercedes 220S has 165 sq. ins. Even the Ferrari 3 liter GT has less braking surface than the Alfa, 233 sq. ins. These are interesting figures and should be studied in relation to the overall weights of the car to be stopped and horsepower ratings as well. Needless to say we experienced no fade in the course of our test. No servo assist is fitted nor is one needed. The 2000 corners with relatively little roll while the Pirelli Cinturatos were found to be extremely noise-free—with excellent grip on both wet and dry surfaces.

The engine compartment is noteworthy for its simple, uncluttered lay-out. Battery and spare tire reside in the luggage compartment along with a beautifully fitted tool kit. All in all, the Alfa 2000 has many things to recommend it; it really is a shame that its price is so high—even in Italy—and for this reason will have a limited acceptance in overseas markets, despite the fact that it is a very good automobile.

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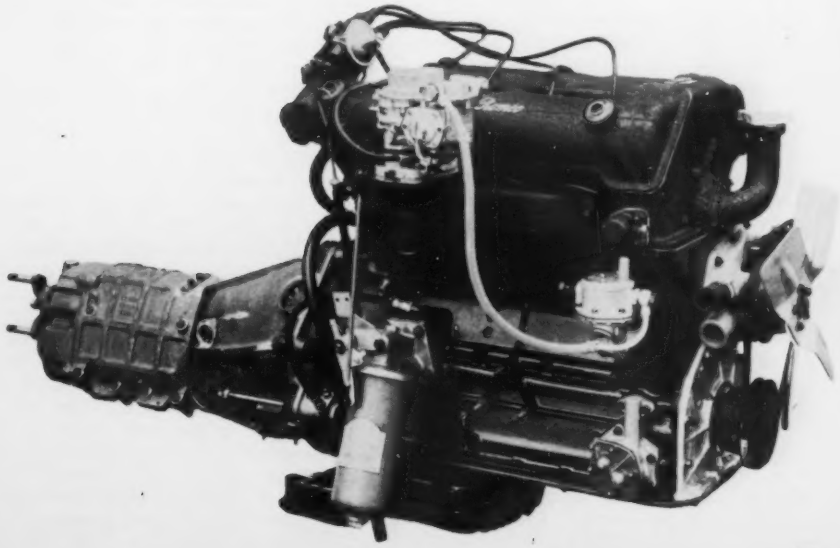

Inside looking out of the Alfa 2000 sedan (left) gives the driver almost full view of the road due to narrow pillars. Instruments are nestled under deep hood to cut down reflections. Use of ribbon speedometer is a doubtful styling touch. Sedan version of new 120 cu. in engine (below) uses one Solex down draft carburetor. Power, to the tune of 105 bhp, comes in at 5300 rpm.

SCI

ROAD TEST: LANCIA APPIA

IT'S WELL known that one of the most symbolic artefacts of our culture is the automobile and that a person's car is generally accepted as an index of his affluence, success and social status. Since crochety, car-hating Thorstein Veblen coined the concept of conspicuous consumption decades ago we Americans have demanded or accepted ever more brazenly conspicuous vehicles and, because we have been conditioned to equate value with mass, cars have grown steadily bigger for reasons that are symbolic rather than utilitarian. So, in the conventional frame of reference of our culture anyone who pays $2900 for a 1090cc Lancia Appia is likely to be regarded with sympathy, if not with ridicule or alarm. But the Appia is a fine car.

By "fine car" we mean one that not only is well designed and well executed (the Model T Ford was both) but in which quality (the substance of quality, not the illusion) is not sacrificed in the interest of economy of manufacture. This quality applies to design, materials and finish and is manifested in a literally *finished* product. The Appia is such a product.

The last of the American fine cars were some of the so-called classics of the 1930's. They were all very large and, except for an occasional rarity such as the Wills St. Claire of the 1920s, there is no American tradition of a fine, smaller car. The European background is different. Rolls-Royce, Hispano-Suiza and Mercedes-Benz, for example, all used to make small-displacement versions of their big cars. They were made to the same standards of quality as the big cars, and were bought by a discriminating elite. This same clientele evidently still flourishes in Italy and the M. E. Hoffman organization, U.S. importer of Lancia, is convinced that it exists here and will welcome the Appia in discreet numbers. Although it is economical to operate the Appia is not economical to buy; and for that reason is not a competitor in the economy field.

In our road test of the costly and luxurious Lancia Aurelia (SCI, August '57) we found it to be a car capable of delighting the most jaded connoisseur. The little Appia is made to the same standards of quality as the elegant, larger machine. The finish of the mechanical components is excellent, the machine work beautiful. Where costlier materials will provide better long-range service they are used. Whether the Appia is experienced on the level of the layman or of the engineer it should inspire the pride and satisfaction that result from the use of an object that is clearly built to the highest standards.

For ease of entry the four-door Appia has no center pillars. The front doors are hinged at the front, the rear ones at the rear and both lock into substantial latches at top and bottom of the body. They close with a solid, crisp thud, require a strong slam. The standard interior is beautifully upholstered in fine mohair fabric and leather upholstery is available in a variety of colors at extra cost.

Behind the wheel the seating position is chair-high and vision is good in all directions. The controls are all handy, the instruments are well located and easy to read. They include gauges for water temperature, oil pressure and fuel supply, with a red light to warn when you're on reserve fuel. The detailing of the interior is excellent and on a par with other high-cost luxury cars. The window moldings and all other interior hardware are made of satin-finish aluminum; the window crank on the driver's side has a swivelling

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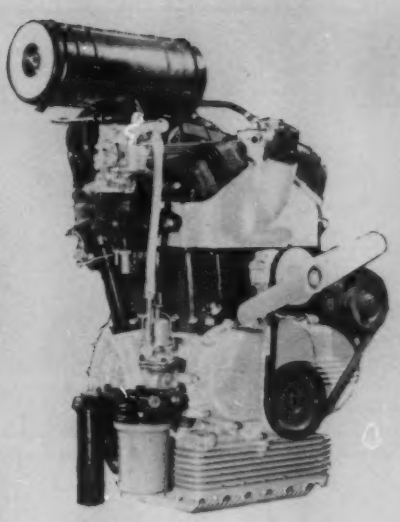
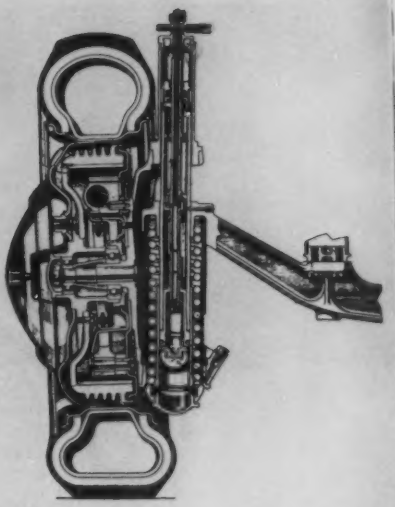
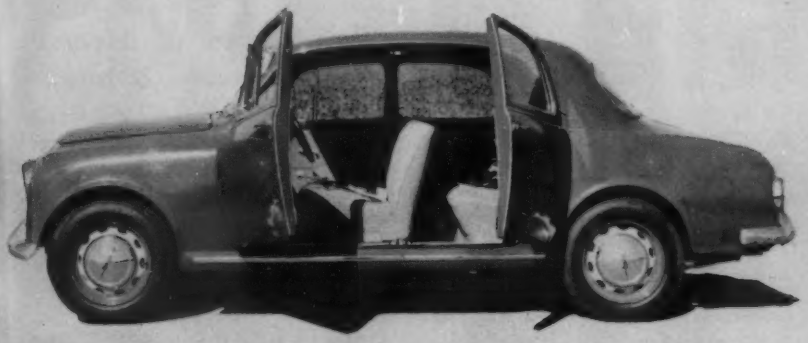






Lancia Appia (far right) is almost austere in use of chrome trim. Omission of door pillars (right) make entry and exit a snap. Appia front end (above) might be called a work of art—not one element can be taken away, nor can anything be added. Smallest Lancia engine is, of all things, a V-4. Workmanship lavished on tiny—66 cu. in. power plant—can only be called Old World in its quality. Cutaway of the Appia front suspension details the use of the classic Lancia sliding pillar to achieve front wheel independence. This system has long been a feature of Lancia cars, and is partly responsible for their outstanding roadholding qualities.

Price at POE $2892
U.S. Importer ..... Hoffman
443 Park Avenue
New York 22, N.Y.

Hoffman
9130 Wilshire Blvd.
Beverly Hills, Calif.

PERFORMANCE

TOP SPEED:

Two-way average ..... 80 mph

ACCELERATION:

From zero to	seconds
30 mph	5.2
40 mph	8.4
50 mph	14.2
60 mph	22.0
70 mph	38.2
Standing ¼ mile	22.2
Speed at end of quarter	61 mph

SPEED RANGES IN GEARS:

I	0-24
II	7-41
III	11-64
IV	16-top

SPEEDOMETER CORRECTION:

Indicated Speed	Timed Speed
30	29
40	39
50	49
60	58
70	68
80	78

FUEL CONSUMPTION:

28-31 mpg

POWER UNIT:

Type	Water-cooled V-4 (10 degree Vee)
Valve Operation	Pushrod overhead valves
Bore & Stroke	2.67 x 2.95 in (68 x 75 mm)
Stroke/Bore Ratio	1.10/1
Displacement	66.5 cu in (1090 cc)
Compression Ratio	7.4/1
Carburetion by	One Solex C32PBIC single throat
Max. Power	43.5 bhp @ 4800 rpm
Max. Torque	56 lbs-ft @ 3000 rpm
Idle Speed	1100 rpm

DRIVE TRAIN:

Transmission ratios		overall ratios
I	4.10	(17.30)
II	2.38	(10.06)
III	1.53	(6.44)
IV	1.00	(4.22)
Final drive ratio	4.22	
Axle torque taken by leaf springs		

CHASSIS:

Frame	Integral body-frame construction
Wheelbase	99 in.
Tread, front and rear	46½ in.
Front Suspension	Independent sliding pillar, coil springs (Lancia patent)
Rear Suspension	Rigid rear axle, semi-elliptic leaf springs
Shock absorbers	Adjustable telescopic
Steering type	Worm and Sector
Steering wheel turns L to L.	2½
Turning diameter, curb to curb	34½ ft.
Brake lining area	144 sq. in.
Tire size	155 x 15 (approx. equiv. to 5.60 x 15)
Rim size	4½J x 15
Length	158 in.
Width	59 in.
Height	55 in.
Weight, curb	2100 lbs.
Weight, as tested	2270 lbs.
Weight distribution, F/R as tested	48/52
Fuel capacity	10 U.S. Gallons
Specific Power Output	0.65 bhp/cu. in.
Power to Weight Ratio, as tested	34.1 lbs./hp.
Piston speed @ 60 mph	1745 ft./min.
Braking Area	127 sq. in./ton
Speed @ 1000 rpm in top gear	16.9 mph

Roy Salvadori and an official push his disabled Lotus out of the way of the big iron on turn three. Car was sidelined when hub sheared after fourteen laps.

French Champion, Maurice Trintignant, looks disgusted at the performance he is turning in. Off his form, Maurice retired his Cooper Climax on the 31st lap.

Moment of truth arrives for Maserati-mounted Bill Krause, as Miles snaps at his heels.

Winner Ken Miles pours it on through turn three. Nose job resulted from dogging in turns.

The only people in their seats at the finish were the drivers!

by Jim Mourning & Bob Rolofson

IF A SCREENWRITER tackled the story of the March 7-8 Examiner Grand Prix at Pomona, California, the script would be snapped up by some enterprising producer before the sound of the typewriter had died away. The event had all the ingredients necessary for one of those quickie racing movies that horrify road racing buffs and earns a million dollars for its maker.

The plot went something like this.

A lean under-dog named Ken Miles entered the "big race" hoping to grab a slice of the $15,000 prize money. His car, an RS Porsche Spyder, was well tuned, but wouldn't have been able to pull its own weight if battle stars had been awarded for the sports car wars in which it had participated. Arrayed against him were three powerful groups of antagonists.

The USAC-Indy drivers, still smarting from their licking at the Riverside Grand Prix, were out for both money and blood. Though better mounted than at Riverside, their machines were still a bit battle-scarred. But then so were most of the others. The newer, hotter stuff was apparently being held for Sebring.

This contingent, led by Jerry Unser, who turned in the second fastest qualifying time in a Kurtis-Cad, included: Tony Bettenhausen, USAC big car champion for '58, Ferrari Monza; Jim Rathmann, 4.9 Ferrari; and George Amick in Chuck Porter's Corvette Special.

The European drivers, of course, weren't interested in dicing for chromed flower pots and had their eyes riveted on the cash. With the exception of the D-Jag driven by Ron Flockhart, twice winner of Le Mans, however, the machinery was strictly small bore. Roy Salvadori was up in Skip Conklin's Lotus Mk XI after running out of Aston Martins on Saturday and Wolfgang Von Trips of Germany was driving a Cooper Climax as was Maurice Trintignant, French champion.

Jean Behra, figured to be a top threat in a Ferrari, failed to show when he reportedly was unable to find a car that satisfied him.

Top favorite among the American sports car clan was Dan Gurney, making his final appearance before joining the Ferrari factory team, in Frank Arciero's 4.9 Ferrari. His was the fastest qualifying time of the week-end. Other contenders were Chuck Daigh, Riverside winner, in a

Chuck Daigh in No. 6, and Jerry Unser in No. 172 were pace setters at the start. The big cars, however, did not remain in contention long. Unser's Kurtis-Cad dropped out with electrical trouble, while Daigh nursed a sick Kurtis-Buick into eighth spot.

Pomona Grand Prix

Kurtis-Cad; Bill Krause in a 4.5 Maserati; and Carroll Shelby in another Maserati.

The stage was set before 40,000 spectators on a 2-mile, 11-turn course that wasn't ideally suited for the amount and size of the hot machinery on hand. The Porsche's greater agility on this type of circuit raised hopes among Miles' supporters that he might be able to pull a "giant killer" act and take home the loot for an over-all win as well as for topping the under 2-liter class. As a matter of fact, several of his fellow competitors indicated that this possibility was not beyond the realm of reason.

Actually, Miles' chances weren't as slim as they seemed. He knew his car, he knew the circuit well and during the qualifying runs only two men—Gurney and Unser—beat the course record he had set during a previous meet. On Saturday, Miles qualified tenth, beating out many faster cars and better known drivers.

The race itself developed as if it had been carefully plotted by some Hollywood writer. At the half-way mark, for instance, not a European driver was left on the track. Sick machinery had conveniently retired Von Trips after two laps, Flockhart after three, Salvadori after fourteen and Trintignant on the 31st lap. Of the American oval-pilots, only Jerry Unser was ever in contention and, as at Riverside, none of them managed to keep their cars in one piece until the checkered flag fell. This left the U. S. sports car lads—or what there was left of them—to fight it out among themselves.

Unfortunately, the early activity had been marred by a serious accident that somewhat dimmed the luster for boosters of American drivers. At the beginning of the tenth lap, Bruce Kessler, driving a Corvette-powered Sadler Mk II, hit a patch of oil near the start-finish line. The car slammed out of control, plowed through the officials' area and hurtled into the cars parked along the course. Four persons, including race chairman Joe Weissman, were struck, the most seriously injured being a woman worker who suffered fractured legs. Kessler received only minor injuries.

After a 45-minute delay, the event was resumed. The cars were sent off in a single file rolling start according to their running position at the time of the crash. Back in action again, Gurney led the way, followed by Unser and Krause.

The front positions remained relatively unchanged until the 30th lap when mechanical gremlins moved in. Gurney went into the pits, his Ferrari suffering from a broken cam shaft, and Unser moved into the lead. On the following lap Unser's Kurtis-Cad found itself on the sidelines with electrical trouble. This apparently left the way wide open for Krause and his Maserati.

While mechanical failure thinned the field drastically, Miles brought his Porsche up into contention despite the loss of his clutch about the time Gurney went out. By the 65th lap he was snapping at the Maserati's tail pipe in the corners, but losing ground again on the straights. Though his determination and ability were applauded, his cause looked rather hopeless.

Then came one of those dime-novel finishes that no one quite believes. On the 74th lap, with only one lap to go, the Maserati blew a tire and Miles breezed home, winning $4500 in prize money for himself and his sponsors, Bob Estes and Otto Zipper. He averaged 85.5 mph.

Second was the Porsche RSK driven by Sam Weiss, who picked up $900 for his finish in the under 2-liter class. Third place Skip Hudson, driving a Ferrari Monza, took first money of $1500 in the over 2-liter class and Krause's Maserati, one lap and 31 seconds behind Miles, limped in for a $1000 slice of the prize pie.

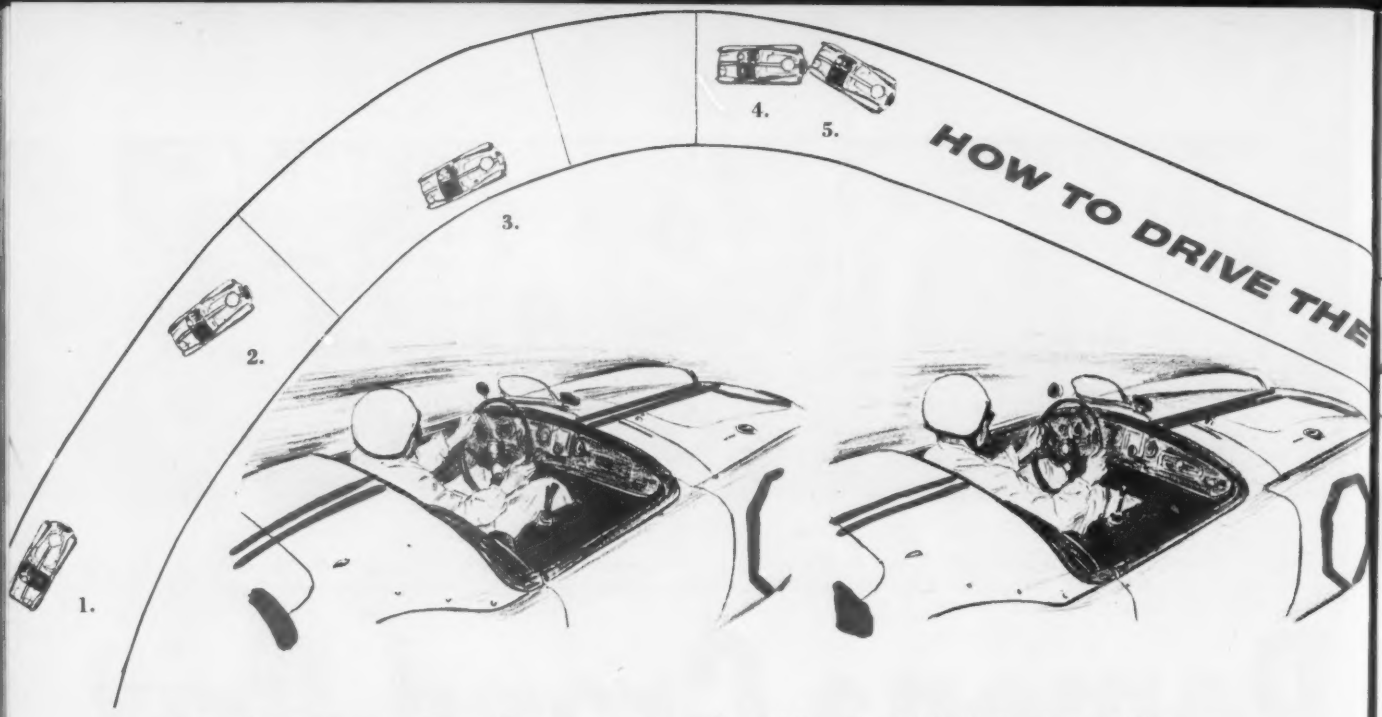
Following Krause were Lloyd Ruby in a 3-liter Maserati, Gordie Glyer driving a Ferrari Testa Rosa and Joe Playan in a Porsche Spyder. Chuck Daigh brought a sick sounding Kurtis-Buick in for eighth.

Out of 36 starters, only 14 got credit for finishing the race. At least one of these, the Cooper driven by Bob Drake, was pushed across the finish line.

The event was sanctioned by the FIA and USAC and was sponsored by the Los Angeles Examiner, the California Sports Car Club and J. C. Agajanian Enterprises.

In the preliminary events, J. E. Lumkin drove an MGA to victory in the race for class F, G and H production cars and Charles Parsons finished his Porsche Carrera GT out in front in the class E production race.

Skip Conklin won the Class G and H modified race in a Lotus Mk XI while Vince Mayell came in first in the race for larger production cars in a Corvette.



HOW TO DRIVE THE M

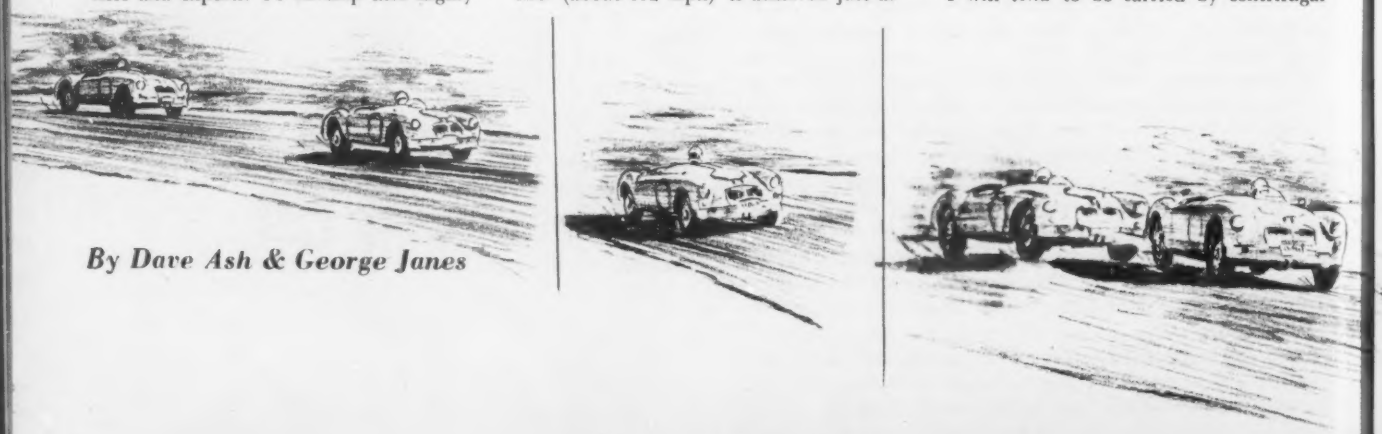
or the fastest way through two corners in Abingdon's latest competition car.

NOT LONG ago a young friend of mine asked me if I could name a typical road racing circuit where he might learn something about competition driving. (He already owns an MG and is a pretty fair touring driver.) I thought for a while and finally realized that there is no such thing as a "typical" road racing circuit. Furthermore, it occured to me that this is a very good thing for experienced race drivers and beginners alike. I say this because if any one course could be truly typical this would mean that all of the courses were pretty much the same—that road widths and surfaces, grading, curve lengths and angles, etc., were all standardized. Obviously this is impossible, but even if it were possible it would be an exceedingly bad thing for the sport because it would soon eliminate all of the challenge and most of the fun from sports car racing. In other words, it is the very differences that exist from one course to another, from one bend to another, that make road racing challenging. And it is these same differences and the necessity to cope with them, that face both beginners and experts. To develop into highly

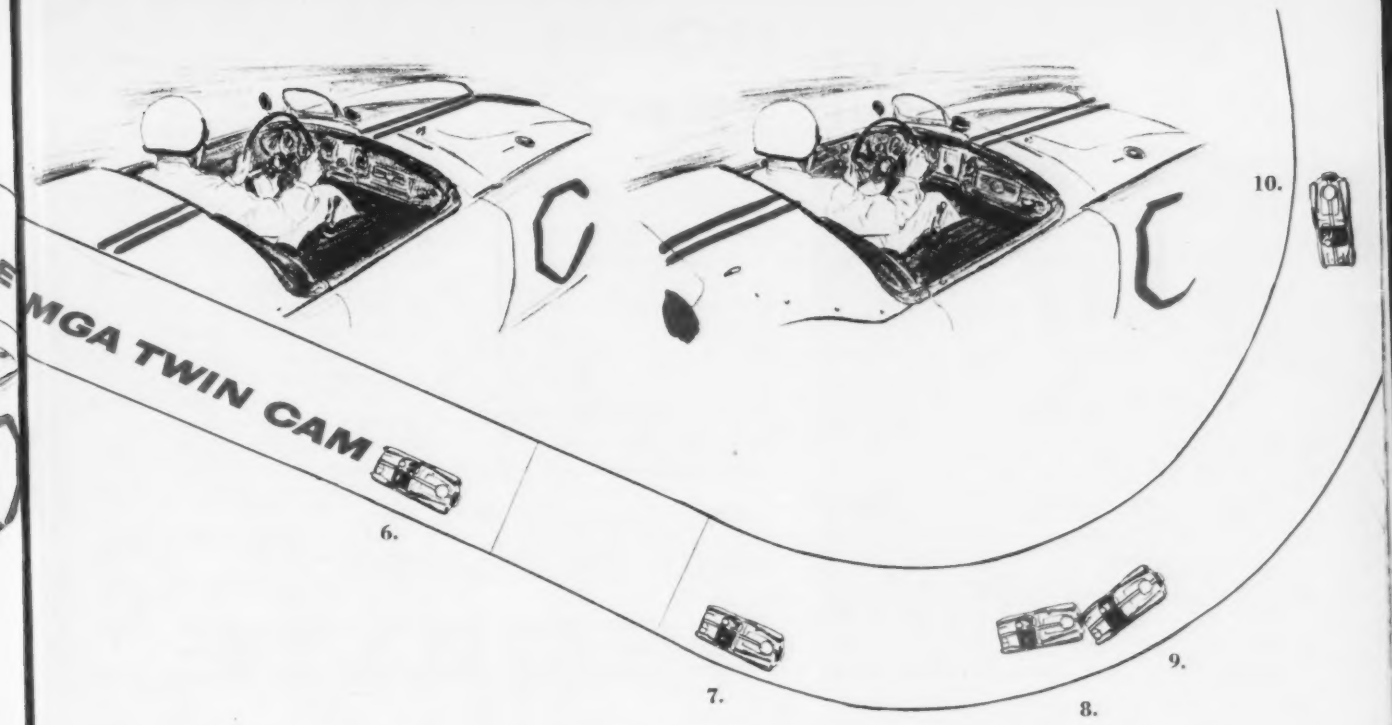
One of the most interesting, and challenging, road racing circuits in the East, and therefore one of the best to learn on, is Lime Rock Park, in Connecticut. The section of the Lime Rock Course that we used in connection with this article comprises just two turns (although I will discuss two others that are inter-connected) that are atypical enough to give you a good idea of the type of problems that are encountered on a road race circuit.

In depicting the "line" through the turns in question I broke the whole process down into 10 basic steps. Artist J. George Janes has covered these steps in his drawings from three angles; if you follow the corresponding numbers as I go over each step in detail you will be able to see (a) the proper positioning of the steering wheel, (b) the path taken by the car, as seen from overhead, and (c) the attitude of the vehicle itself on the road at each point. There is a map of the entire course on pages 62 and 63 that will give you the over-all picture.

As I drive down the pit straight, maximum speed in the twin-overhead-cam MG (about 112 mph) is achieved just as I approach the marker that is placed 100 yards from the first turn. At this point I am in high gear, driving about five feet from the left-hand edge of the road. With the excellent disc brakes of the twin-cam MG I am able to delay my braking until just past the 100-yard marker, and then, as I apply the brakes hard, I shift down to third gear. (I stay in third all the way around the rest of the circuit, until I come back onto the main straight again). The first turn, which is not included in our step-by-step diagrams, is *part* of what is known as the Hook. Actually a separate turn in itself, this first part of the Hook is more or less a constant-radius bend and is taken in "classic" style. That is, when I have gotten the speed of the car down to about 6000 rpm in third gear (4.55-1 axle ratio) (about 70 mph) I begin to steer across from the left-hand side of the road, heading for the apex of the turn on the inside. This is a critical point because from here the car has to be positioned properly for the short approach to the second part of the Hook. I like to enter the first turn just fast enough so that I will *tend* to be carried by centrifugal



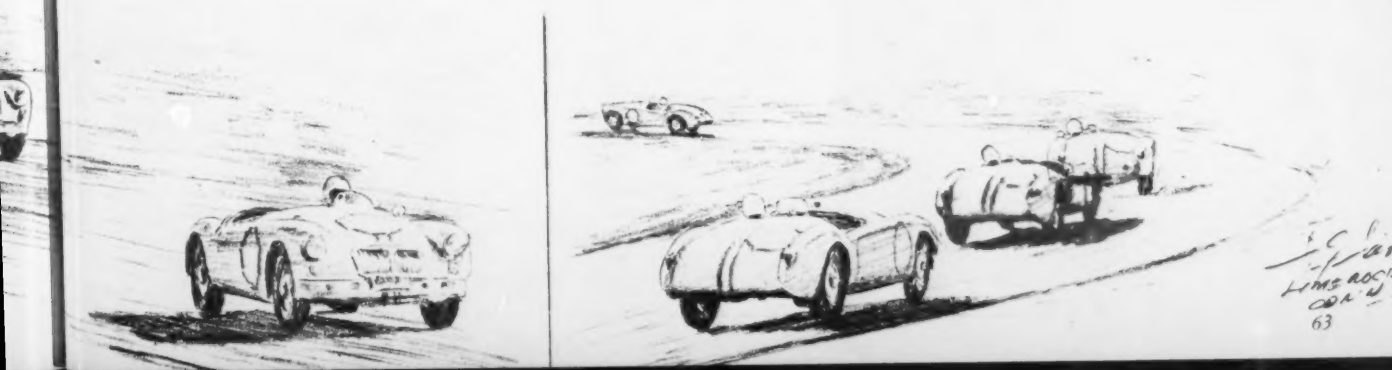
By Dave Ash & George Janes



force, sliding slightly, to the left side of the road. If I drove into this turn too fast I would slide too violently and might go off the road altogether on the left-hand side. Or, if I managed to stay on the road, the corrective action needed to accomplish this would slow the car. In this case the engine revs would fall off so much that I would not have enough power available to take the next turn properly; a downshift to second gear might be necessary, and this is certainly to be avoided. On the other hand I would find if I took the first turn too slowly, that I was too far to the right to go into the second part of the Hook correctly. I would have to *drive* across to the left and then my engine revs would still be too low.

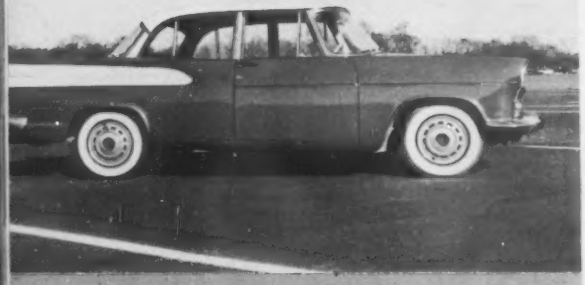
Assuming, however, that I have driven through the first turn perfectly, and at optimum speed, I now find myself, at position #1 in our step-by-step series. The car is just shy of being half-way between the first and second turns of the Hook, about three feet from the left-hand side of the track. Here, for a brief instant, the wheels are pointed straight ahead. Then I steer slightly to the right and drive (not slide) ahead for about two-car lengths. For these few feet I am driving on what might be called a "trailing throttle" — not quite applying enough power to make the rear wheels begin to break loose. Then, at point #2, without changing the steering wheel position, I begin to apply more power so that the traction is broken slightly on the rear wheels, causing them to slide out. Thus the car is actually oversteering a bit, whereas the MG normally will understeer. This oversteer accomplishes two things. It keeps the car from sliding too far out to the left, nose first, and it keeps the car pointed more and more into the turn which, from its apex, begins to decrease in radius. This decreasing radius, in which the turn gets tighter and tighter as we go around it, is what makes it tricky. In position #3 I am between two and three feet from the right-hand edge of the road. The front wheels are hardly sliding at all; the rear wheels are sliding out just enough to keep the car heading into the turn. Since the steering wheel is held steady, to maintain the correct line I must, as the radius tightens, apply just enough power to keep the car more or less parallel with the sides of the road. If I am applying too much power the rear wheels will swing out too far, pointing the nose of the car too far to the right. The car will be forced to sideslip too much and this will waste time, not to mention rubber and engine revs. If I have not applied enough power I will tend to slide too far to the left, again creating too much sideslip, but in another direction. From this you can see that one of the secrets of driving the MG properly and smoothly is delicate throttle work, with a minimum of exaggerated steering-wheel twisting. It is, however, better as a rule to come into a corner a little too slowly rather than a little too fast; it is easier and usually less wasteful to apply more gas than to have to correct for a mistake resulting from too much speed. The big trick in motor racing is to come *out* of corners quickly so as to take best advantage of the straightaways. If you go into a corner way over your head you will invariably come out of it slowly, if you are fortunate enough not to fall off the road altogether. Even if your average speed through that particular bend is no lower than the driver

(Continued on page 79)

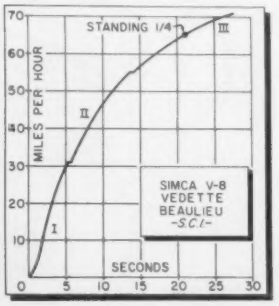


SCI ROAD TEST

Although it took a bit of doing the Vedette proved out as an understeering automobile. Light steering masked this fact until SCI staffers pushed car hard around traffic circle.



Simca profile (above) might be close to that of proposed Detroit "compact" cars. Frenched head lights and finned rear make Vedette look longer than it really is. Gallic interpretation of American instrumentation (below) is not quite a carbon copy.



SIMCA VEDETTE

Price at East Coast POE $2398
U.S. Importer ..... Chrysler Corporation, Detroit, Michigan

PERFORMANCE

TOP SPEED:

Estimated	98 mph

ACCELERATION:

From zero to	seconds
30 mph	5.1
40 mph	8.0
50 mph	11.4
60 mph	17.2
70 mph	26.5
Standing ¼ mile	21.2
Speed at end of quarter	65 mph

SPEED RANGES IN GEARS:

I	0-31
II	7-55
III	10-top

SPEEDOMETER CORRECTION:

Indicated Speed	Timed Speed
30	30
40	41
50	48
60	59½
70	69

FUEL CONSUMPTION:

20 mpg

SPECIFICATIONS

POWER UNIT:

Derived from pre-war Ford V-8/60	Water cooled V-8
Valve Arrangement	In-line side valve
Bore & Stroke	2.60 x 3.37 in
Stroke/Bore Ratio	1.30/1 (66.1 x 85.7 mm)
Displacement	143.5 cu. in (2351 cc)
Compression Ratio	7.5/1
Carburetion by	Zenith 32 NDIX
Max. Power	84 bhp @ 4800 rpm
Max. Torque	112 lbs-ft @ 2750 rpm

DRIVE TRAIN:

Transmission ratios test car	overall ratio
I 3.11	(12.14)
II 1.77	(6.91)
III 1.00	(3.90)
Final drive ratio	3.88
Axle torque taken by	leaf springs

CHASSIS:

Wheelbase	160 in.
Tread, front and rear	54, 53 in.
Front Suspension	McPherson strut with lower control arm and anti-roll bar
Rear Suspension	Rigid rear axle with semi-elliptic leaf springs
Shock absorbers	tubular, concentric with coil springs at front
Steering type	Gemmer worm and roller
Steering wheel turns L to L	3½
Turning diameter, curb to curb	37 ft.
Brakes	11 in. drums, two leading shoe front
Brake lining area	193½ sq. in.
Tire size	6.50 x 15

GENERAL:

Length	187 in.
Width	69 in.
Height	59 in.
Weight, curb	2660 lbs.
Weight, as tested	2956 lbs.
Fuel capacity	15.8 U.S. gallons

RATING FACTORS:

Specific Power Output	0.59 bhp/cu. in.
Power to Weight Ratio, as tested	35.5 lbs/hp
Piston speed @ 60 mph	1675 ft/min
Braking Area	139 sq in./ton
Speed @ 1000 rpm in top gear	20.2 mph

IF THERE is one memorable thing about Simca's latest and largest offering, the Vedette *Beaulieu*, it is the curiosity the car arouses. Parking lot attendants would start to put it down as a Studebaker, then take a quick double-take and ask in some puzzlement what the dickens was a "byoo-loo."

Others, with a keen ear and a long memory, on listening to the very distinctive and decidedly un-European beat from under the hood immediately guessed "Ford".

Still others, attuned to the trends of the times noticed the Chrysler Corporation sticker and, looking no further, demanded to know if this were Chrysler's new compact car.

The answers are in order: It's a Simca even if the name doesn't appear on the car. Well, yes, it *is* sort of a Ford — or rather, *was*. No, it's NOT the new small Chrysler car or even a substitute for it. And as far as that goes it's not a *small* car at all. Parked alongside the average small import, the Vedette takes on pretty hefty proportions. In fact, it looks like what it is: the French equivalent of the American "compact car".

The Vedette has been around in various guises for a good number of years and during that time has taken on the aspect of a national habit in its own land. Of all cars sold in France carrying engines of over two liters, the Simca Vedette accounts for a majority of landslide proportions.

It all began some five years ago when Ford of France introduced an entirely new car called the Versailles — that is, it was entirely new except for the power plant. And this brings us to the second question noted above and its answer. The power plant of the Detroit-designed, French-built Versailles was an old and much-beloved world-wide favorite, the V-8 Sixty. It had been given a mild hot-rodding job consisting of raising the stroke to 3.36 inches, a very slight raise in compression ratio and a slightly warmer cam timing. The result was an amazing 40% increase in power for a nine-percent increase in displacement, bringing the power up to 84 hp.

Immediately after its introduction, the Ford company's French holdings were taken over by Simca who further developed the Versailles during the succeeding years with the success mentioned above. To be brief, in France the Simca Vedette is very desireable property.

The interior details do nothing to detract from the impression that this is indeed a small American car. The four-door configuration allows the use of two wide bench-type seats that are upholstered in two-tone vinyl and have that plus, no-lateral-support look so common on domestic products. The six-passenger designation is just a little bit misleading in that rear passenger leg room is at a bare minimum when the front seat is adjusted to accommodate a long-legged driver. (But isn't that true on almost all sedans nowadays?) Individual front seats have the advantage in cases like this.

The wraparound windshield and extensive side glass area give a light airy feeling to the interior. The huge rear window and narrow pillars, combined with the rear fender fins, effectively locates the rear end when maneuvering in reverse.

Instrumentation is quite complete and situated directly in front of the driver. The column-mounted shift lever is placed rather far forward and requires a long swing into second gear — familiar indeed to old-time Ford drivers. On the opposite side of the column is the typical French control mechanism that is pushed, pulled, and twisted to provide a variety of lighting effects. The turn signal control is cleverly placed on the column in a manner calculated to make it difficult to use — on the top of the column, beyond the horn ring.

One advantage of having fins and rear overhang is that the luggage compartment becomes quite a bit larger. The spare tire sits vertically to one side of the trunk, behind the rear wheel well, and allows uncluttered space for suitcases et al. A similar spare wheel well is located on the opposite side of the trunk which allows the owner to carry two spares if he wants.

The looks of the car may lead the unwary into the belief that this is merely a Detroit sedan with a French accent and an import tax. Given a few minutes behind the wheel, however, all these details fade into the background as one becomes aware that this is, for all its outward appearance, a decidedly French automobile.

Starting is, as might be expected by those experienced with the old Sixty, immediate. Once started the engine sets up a busy, smooth idle that can be immediately kicked into a throaty growl that is the distinct property of the well-tuned Ford flat-head and nothing else. It's more felt than heard, evoking some very pleasant memories of other engines long since gone.

The clutch is light, smooth and very positive. Because of the good bite and the increased cam timing, a certain amount of right-and-left foot co-ordination is required for a smooth start. Once under way the car takes off in a rush, each time with that satisfying feeling of eight small pistons busily pumping. Again due to the hotter valve timing there isn't too much torque at the bottom end of each gear range but as the revs climb to about 3000 rpm the power comes on strongly and continues — to about 30 mph in low, 50 in second and on up to around 90 in high gear. Cruising is comfortable at any point between 40 and 80 mph.

However, there is one serious lack in the Vedette. Simca make a very nice four-speed gearbox for all the other models including the Arione, which is a four-cylinder version of the Vedette. Unfortunately the Vedette doesn't have this box. True, compared to the four cylinder versions the V-8 is a torque producer but the high revving characteristics and comparatively high torque peak of 2800 rpm would seem to indicate the need of four speeds. The spacing between the ratios of the three-speed unit are such that the engine must be set screaming in the lower gear. Downshifts must also be carefully made. Perhaps such doings are not important on long cruises along a straight *Route National* without speed limits and stop signs but in over-regulated American urban areas with stops, starts, and ten different speed limits per mile, a close ratio four-speed transmission would be a blessing.

The Vedette's handling characteristics came in for considerable discussion among our staff. Not criticizing, just trying to come up with a satisfactory description. We started out at logger heads, with one claiming that it oversteered, another stating that it plowed just like its Detroit cousins and still another firm in his belief that it was very nearly a neutral steerer. When all the shouting died down, we had agreed that the Vedette's play-free steering linkage gave such quick response to even small movements of the wheel that one unaccustomed to this might imagine that the resultant twitchiness was oversteer. Familiarity with the car soon eliminates this problem.

Some careful tests around a large traffic rotary showed conclusively that increased speeds at the same radius of turn required the front wheels be turned further into the turn, a sure-enough indication of understeer. The neutral steer proponent was mollified on the theory that the Vedette's understeering qualities are well camouflaged by the combined lightness and quickness of the steering system. We had long since agreed that no matter how you describe its handling, this was a very pleasant sedan to drive. At night, the excellent headlights reached out as if to help gobble up the miles for you. Our only real complaint while driving was the extreme sensitivity to side winds.

One member tried to sum the Vedette up by saying that it was in essence a miniaturized Detroit car, that it enjoyed all their vices and virtues but the smallness of the helpings made the vices bearable without spoiling the virtues. This rank heresy was met by an outcry of boos and catcalls because anyone who knows that imported cars are good knows that Detroit cars must be bad. That being the case, we are forced to say nothing about the comfortable ride which, combined with the rather nimble handling, made driving a pleasure on secondary roads where larger cars are at a loss due to their very size and ponderosity.

—*jpc*

Ducted Cooling Means Lower Temperatures and Higher Speeds.

Win By a Nose

by Karl Ludvigsen

BACK IN August of '57 the MG boys rocked the go-fast world back on its collective heels with three consecutive runs down the long course at Bonneville. That was all Stirling Moss and their EX 181 needed to post a new mile record, for cars of 91 cu.in., of 245.11 mph, some 40 miles over the previous mark held by MG EX 135. 245 isn't astronomical nowadays at Bonneville, being within reach of most Chrysler streamliners with around 500 horses, but this MG did it with just about *half* the power, and if called on could keep it up all day long.

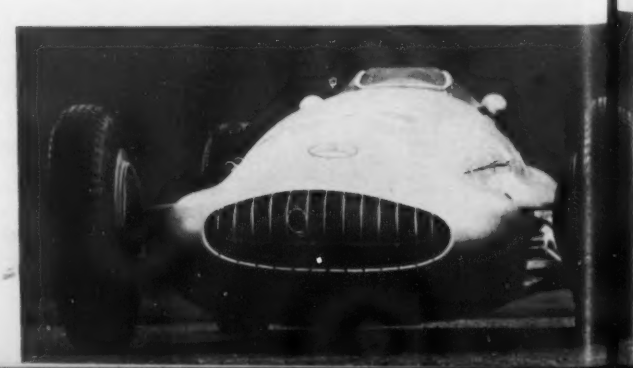
How did they do it? By designing in some of the cleverest aerodynamics to be seen today. And one of the most ingenious features dealt with the cooling system, which, since the car may be called upon to go for long-distance figures, couldn't just be a recirculating pipe or an ice tank as was used in the otherwise similar Napier-Railton World Speed Record holder. They needed a radiator, and a radiator means DRAG. To slash it to a minimum designer Syd Enever stashed a wedge-shaped radiator in each flank and stingily doled air out to them from separate ducts from the nose. Warmed air was led away to points on the body surface where it would contribute to smooth laminar flow. In short he used no more air than he absolutely needed and had it under complete control from entry to exit. The result was a total cooling drag of fourteen pounds at speed.

You're all quite familiar with the much-discussed problem of streamlining, or more specifically of the easy flow of air over the outside of a car's body. It has literally everything to do with top speed, and exerts a major influence on drag and general road performance. Of equal importance but seldom given the same consideration is the flow of air *inside* the body. The modern competition machine operates all its components as near their "breaking points" as possible, to get the most from the least car weight. As a result temperatures will run higher by far than in passenger car practice, units like the tires, brakes, differential, shocks, gearbox and clutch — not to mention the driver — requiring certain quantities of cooling air to postpone failure. Most important of course is engine cooling, through water, oil and possibly direct, as in the Dyna-Panhard and DB. (Fan-cooled engines like the Porsche and VW gain horses by having no direct air ram but lose them again in turning the complex fan).

Assuming similar cooling systems, it is logical that cooling drag accounts for a bigger percentage of the total figure as the streamlining of a car is improved. In other words internal streamlining becomes more and more important as the outside shape is cleaned up. Let's take for example two Mercedes competition cars: the W163 open-wheeled Grand Prix car of 1939, and the W196S or 300SLR sports/racing car of 1955 — by definition with fully-enclosed body. It's characteristic of open-wheeled cars, like lakesters, that the unstreamlined wheels and axles account for the bulk of the drag. Indeed in the case of the W163 the body drag was figured to be only about ten per cent of the total! Even more startling is the estimate that cooling drag is about eight percent of the total figure, leading to the final conclusion that the oil and water radiators account for *eighty percent* of the drag of the very sleek body. Noting the proportion of grille area to body frontal area, this doesn't seem out of line. Also the '39 Merks were said to go considerably faster per horsepower than the '38 W154, which differed mainly in having a more restricted, poorly designed radiator layout. In the case of such a Grand Prix car or comparable Indy car, then, just about the only body change that will have any effect on drag must be cooling air flow refinement.

While cooling made up eight percent of the W163's drag, it amounted to 15 to 18 percent of the total in the case of the 300SLR. Being fully enclosed the sports Mercedes had many other drag worries, which I'll mention later, but at about 1/5 of the total, the cooling air flow was a prime offender, having twice as much influence on high-speed performance as the comparable system in the W163. Now if you're even partly convinced that cooling air deserves very special handling, come along while we get a rough idea of how to go about it.

For our purposes we should first take a look at our par-



More power means more air. W 163 Merc (left) had about three-fifths bigger engine than W 165 (right). Relative engine sizes are reflected in the areas of the two grill openings.

ticular body with no cooling system at all. Wind tunnel testing and practical experiment show that, at speed, each section of body surface has a characteristic air pressure above, at or below atmospheric pressure. Recent tests on a fully-enclosed Connaught shell gave typical results, showing the highest pressure right at the nose. Additional high-pressure areas are at the base of the windshield, just under the driver's seat, and surprisingly at the tip of the finned tail. Low-pressure or suction areas abound over most of the underbody of the car and across the top of the hood, and are invariably found along the body sides and in the wheel wells. Suction is most extreme in and above the cockpit, a fact that has been successfully exploited by the Vanwall Grand Prix car designers.

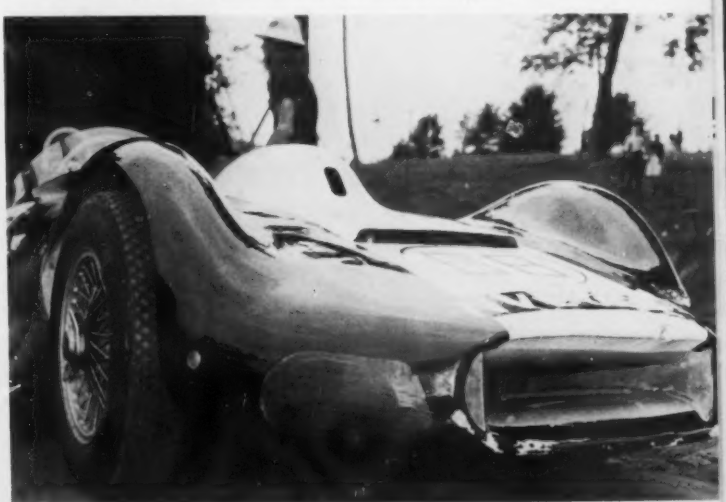
Knowing where the areas of high pressure and suction are located, we should do our best to feed air to the radiator from a high-pressure point and exhaust hot air into a high-suction area. This'll promote the best possible flow internally and will have additional salutary effects on external drag. It's important to locate high and low pressure points which are dependable. All too easily, for example, can a suction point suddenly become high pressure under the influence of a side wind or a 100 mph corner. In general the suction areas at the sides and bottom of the body are more reliable than those atop the hood, unless special external shapes are adopted to maintain the latter. High pressure can always be found at the nose and at the base of the windshield.

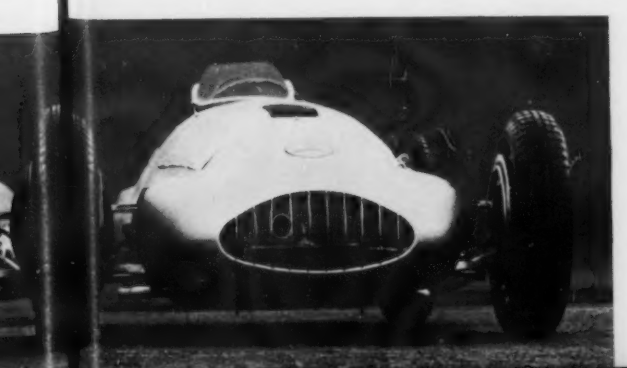
Another almost self-evident point involves the relative areas of the radiator and air inlet opening, and the type of ducting between them. From the first of course we won't tolerate a radiator that's not as small as the horsepower and climate will allow. The higher-velocity air flow that derives from proper ducting may also permit a thinner core than would ordinarily be needed. Remember that temperatures needn't be much lower than 180°F, and that water and

(Continued on page 82)

Original single-seater Lotus had small air intake in relation to the size of the angled radiator. Hot air is deflected downwards.

Long Lister-Bristol nose helps smooth internal air flow. Length allows gradual bends in entry and exit air path.





BROOKLANDS 500

By Dennis May

"Inclined to be secretive", the British Racing Drivers' Club hid the light of their Indy-length classic under a bushel.

ANY SIMILARITY or parallel between the Brooklands 500-Miles Race and its American counterpart can be stated without even shifting the typewriter into plural gear. Both races went 500 miles. There the equivalence ended. The former, staged each fall from 1929 to '37, was as *formule libre* as a St. Patrick's Day fist fight. At Brooklands, the winner's prize money wouldn't have covered race period hotel bills for an average Indy runner and his retinue. In its nine years' lifespan, probably not more than three cars were built specially for the English 500. To its organisers, the British Racing Drivers' Club, ballyhoo was as distasteful as blackmail and the whole affair came off amid fanfares of reticence.

Hence the fallacy which flourished in America that the Memorial Day classic was the fastest race of its distance in the world. It wasn't—the British 500 was. But BRDC utterances on this subject looked like inadvertent leaks from their official secrets file, rather than loud, high frequency, ocean spanning boasts.

To Americans familiar with the toothcomb qualifying standards in force at Indianapolis, perhaps the strangest feature of the English race was the promotors' unconcern for the ritual of timed and observed rehearsals. This *fais ce que voudrais* spirit set its stamp on the series from the beginning, and in 1929 was the means of rescuing W. O. Bentley from a quandary. Here's what happened:—

Bentley's lone works entry for the inaugural 500 was a special Speed Six, which with a lap speed potential of around 127 mph looked like being the fastest thing in the act; also the most dangerous, at least for anyone unfamiliar with the requisite technique of letting the car handle the driver, rather than vice versa. With a car like that on a track like Brooklands you wouldn't ask a dog to drive 500 miles single-handed, and Bentley accordingly nominated two drivers. They both practised but only one of them, Clive Dunfee, agreed to race. The other, who shall be nameless, flatly and unconditionally washed his hands of the matter, opining that in a field that was going to cover a displacement range from 750 cc to 17½ litres, anyone who fell for W. O.'s proposition must be wrong in the rocker box.

At his wits' end, Mr. Bentley was still canvassing for a copilot on the morning of the race. Then, eureka!, he found a taker—S. C. H. Davis. Otherwise unoccupied, except insofar as his employer, the editor of *Autocar*, had sent him to Brooklands to report the 500, Sammy Davis agreed that subject to the stewards' consent he would indeed pair in with Dunfee. W. O., evidently having seen Davis coming, had, it developed, gotten the stewards' nod in advance, so *that* was okay.

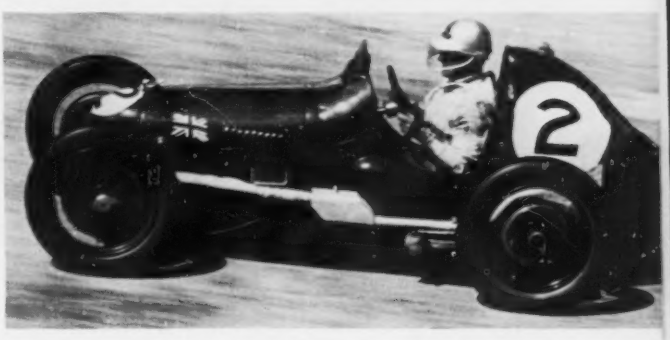
Until he took over from Dunfee, who did the first spell, Sammy's inexperience of six-cylinder Bentleys was total: he'd never even sat in a Speed Six before.

"It was an odd ride", as he afterwards expressed it with masterly understatement in his book entitled *Motor Racing*. "I did not know what our signals were, I did not know when to come in, and I had to identify the important instruments as and when I could; the rev counter was obvious but for a long time I thought the thermometer was the oil gauge, while the discovery that the handle was missing from the air pressure pump created quite a brain storm until I realised that the machine must have an electric pump for the fuel feed, so it was not necessary for me to pump pressure at all".

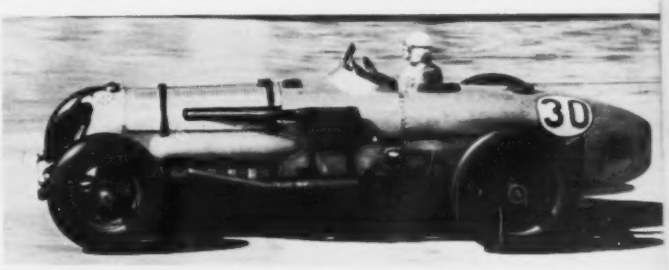
He hadn't even known where to find the gear lever until he was in the race and actually rolling. On quitting the car after his opening stint, Dunfee had left it in gear, and the engine was restarted with the clutch out. Pulling away from the pit and running the revs up to shifting speed, Sammy made a pass at the place where the lever lived on all the Bentleys of his acquaintance—inside the cockpit—and fastened a firm grip on thin air. "I had," as he recalled it in *Motor Racing*, "a sense of panic which lasted until I located the blamed thing outside the body."

Drivers, mechanics, and assorted hangers-on await the start of the 1936 Five-Hundred. This is one starting group as per handicap

Typical cars in the heavier class were one-off chassis with single-place bodies. Bentley engines and fat tires were used.



Both ends of the handicap scale. Displacements ranged from 750 cc to 24,000 cc. Above is the smallest, a DOHC Austin Seven, while the monster below is John Cobb's aircraft-engined Napier Railton which averaged 127.05 mph in 1937.



So taking it all around the Davis/Dunfee partnership wasn't contracted in an auspicious climate. It nevertheless resulted in a race average of 109.4 mph by the Bentley with a reputation as a rogue, which was 8.27 mph above the contemporary Indy record. Davis, the fugitive from a typewriter, the stand-in who had learnt his controls by braille as he raced, also set the fastest lap of the day, 126.09. The British 500 being a handicap, the fastest finisher wasn't necessarily the winner, as Clive and Sammy demonstrated by placing second to a 4½ unblown Bentley that averaged 107.32, shared by Barclay and Clement.

Six years later, in 1935, a driver's ignorance of which

John Cobb and the Napier Railton taking a high line on the Home Banking which was so steep in spots that it could not be climbed on foot.

The men who drove the largest and the smallest. Cobb, left, won twice in the Napier, while Sammy Davis and the Earl of March took the 1930 event in an Austin.

knobs to pull, and when, lost him the race. A hybrid Bugatti, consisting of a 3.3 litre GP chassis with a single-carb unsupercharged engine fitted, was delivered from Molsheim on Five-Hundred Eve. With their usual complaisance, the stewards okay'd the entry, waiving the little formality of practise by Earl Howe and Brian Lewis, the codrivers concerned. At an advanced stage of the race, when slide-rule estimators of the handicap arithmetic were foretelling victory for the Bugatti over John Cobb's big Napier Railton, the Bug's carburetor started flooding. Lewis, who was driving at the time, pushed, pulled and tweaked everything in sight on the dash in the hope of finding something that would relieve excess tank pressure. He either didn't find the right trigger or he pushed (or maybe pulled) when he should have tweaked. The flooding persisted and fouled the plugs. So the 3.3 finished third instead of winning.

Although there were two fatal crashes during the 500 series, and many other wrecks in which drivers escaped with their lives through seemingly miraculous luck, the races were, with momentary respites, about as exciting to watch as an old folks' whistdrive. This was partly the outcome of the handicap system, which in turn was necessitated by the prevailing dearth of cars of anything resembling matched performance. It wouldn't have done the BRDC any good to run the race under, for instance, the contemporary Grand Prix formula because iron of the prescribed type was only available in very limited numbers in England; and the few natives who did own such machinery usually valued its health too highly to submit it to the ordeal of 500 flatout miles. Anyway, of course, GP cars never were designed for Brooklands and suchlike homes of *vitesse pure;* not that specificational unsuitability deterred anybody from essaying the 500 if he really felt the itch, oh no.

In fact, to show you the sort of fascination it exerted on its devotees, there was a case of an aspirant who took it so much to heart when the scrutineers refused to pass his car that he shortly committed suicide.

With capacity differentials of as much as 23 litres between the limit and scratch cars, the opening stages of the 500 condemned spectators to the almost hypnotic boredom of watching a school of seven-fifties circulating by themselves — a thinly spread armada of coracles bobbing on an ocean of concrete. On two occasions, in 1931 and '33, the first-away class, 750 cc unsupercharged, attracted exactly one runner; as you can imagine, his departure and subsequent solitary progression had all the dramatic impact of somebody unravelling a bedsock. Cars were released at intervals in international class groups and subgroups dividing the blown from the unblown, the whole cavalcade taking as much as two hours to get underway.

By definition, you presumably can't have an anticlimax without a climax, but the BRDC 500, by virtue of a pre-war English recipe for petering races out instead of just finishing them, saved up the nadir of boredom until the end. Under this system, cars still combatant when the third placeman completed the course had their agony prolonged for a further half-hour. The average rate of mechanical mortality being what it was — out of eighteen starters in 1936, for instance, four ranked as official finishers — the public wasn't exactly surfeited with excitement as the 500 died its thirty-minute death.

The BRDC's interpretation of *formula libre* was absolute. There was, as already noted, no restriction on engine displacement or design. Cars could be of sports or racing type — the former often predominated, accounting for 75 percent of the field in 1931. Bodies ranged from single-placers to full four-seaters. If you had room for a traveling mechanic you pleased yourself whether you carried one — some did, some didn't. There was nothing in the rules against single-handed drives (two 500s were won *à seul*) but twosomes were in the majority. Weight was unconfined, fuel could be anything that would burn. From 1935 onwards, women were eligible as drivers, by invitation.

About the only proviso, in fact, was that cars had to be capable of lapping at at least eighty, a speed which, on the wide opens paces of Brookland, looked little more than glacial. This was upped to a hundred in the declining years of the series.

In more than one sense, the 500 was a race of unique contrasts. As well as the enormous gulf in size and displacement between the smallest and biggest cars, there were riotous disparities of status, financial resources and organisational standards among the fraternity of the long haul. On the one hand you were liable to get full works teams of professionally handled and meticulously prepared cars, controlled and serviced with military precision; at the other extreme you had the Scuderia Shoestring element-entrant-drivers who perhaps had trouble rustling up the five pounds entry fee (yes, you paid the club for the privilege of racing, not vice versa). Then, somewhere in the middle of this mixed-up marathon's hierarchy, came the well heeled and equipped independents like Eyston, Cobb, Birkin, Barclay, most of whom although by no means amateurs in the sense that they'd forego monetary gain from racing weren't full-time pro's either. This caste preferred success to failure and strove for it with varying degrees of diligence and expertise, but to them, as to Charles James Fox, "the greatest pleasure of life, after winning, was losing".

Five-Hundred lore is rich in stories of racing on a bootstrap budget, starting back in 1929 with the privations of John Pole and his mighty Merc. This 17½ litre wildfowl, powered by a 6-cylinder airplane engine dating from just after WW1, was the shared hobby of two young RAF officers, Pole and John Noel. It had a theoretical top speed of nearly 150 mph and the flyers conservatively set themselves a 115 mph lap speed schedule for the race. On divulging their intentions to Dunlop, however, they were warned that even this feet-dragging pace would involve the consumption of probably sixteen tires. Sobered, they did some fresh arithmetic, found their joint wealth would just cover a couple of spare casings, and, in the light of this limitation, lowered their sights to an even hundred.

This they duly maintained, albeit chagrined at spoiling the trip for a ha'porth of tire. As an aid to trackholding, incidentally, the big Merc was ballasted with over 300 pounds of gravel (that, anyway, could be had for free), as William Boddy records in his three-volume *Story of Brooklands*.

There was even something a bit pathetic about the economies perforcedly practised by underpriviledged 500 contestants. In 1932, for example, MG driver R. T. Horton cut his pit staff to the irreducable minimum by having one man combine the functions of mechanic, timekeeper, spotter, chart compiler, tea brewer and general domo. Yet this was an occasion when parsimony and success went hand in hand, though only because an unexpected turn of events enabled Horton's supporting cast to be heavily reinforced in midrace. Bert

(Continued on page 93)

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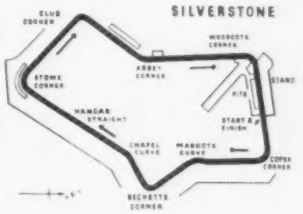

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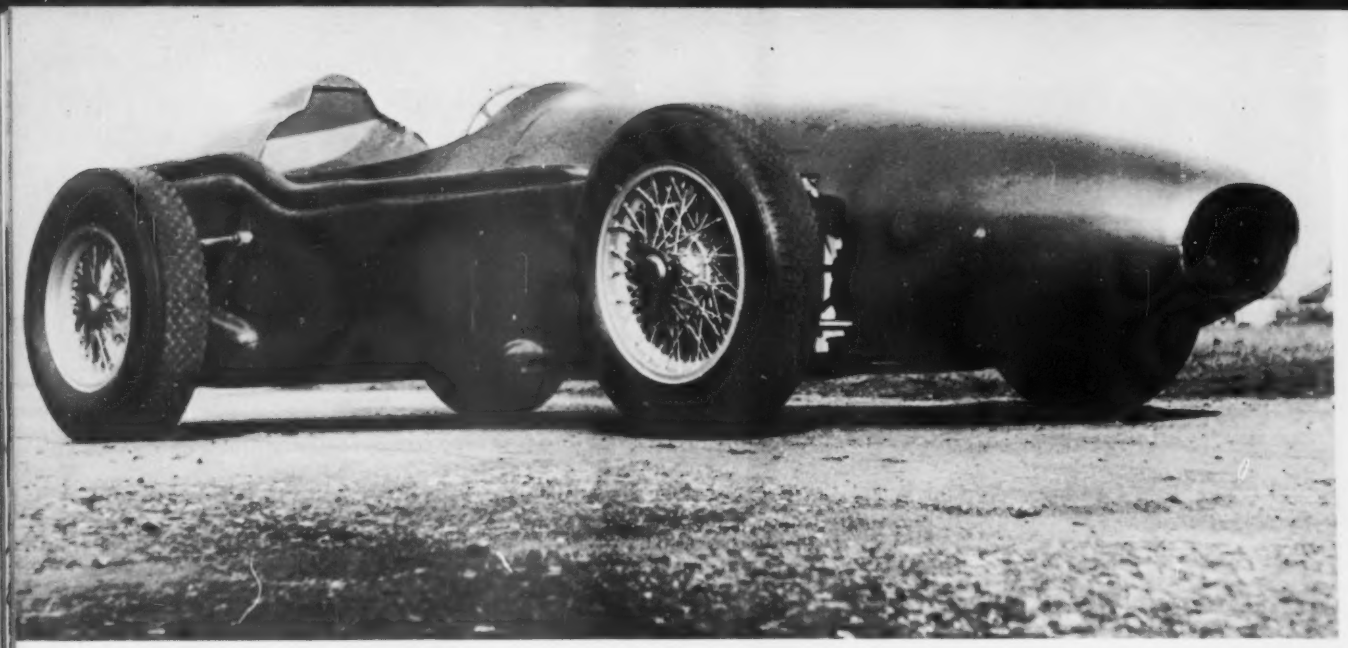


Multi-tube frame has one member that crosses the cockpit at the bottom of the dashboard. Shift lever connects to rear gearbox.

ASTON MARTIN ENTERS G.P. RACING

EVEN THOUGH the C.S.I. has changed the G.P. formula to be effective with the 1961 season, Aston Martin has decided to enter their new 2½ liter single-seater for the two remaining seasons. By the time this is read the new car will have put in an appearance at the B.R.D.C. International Trophy Race at Silverstone and will have given some indication of its potential. If it is true that a new machine requires a season or two to reach fruition, the Aston seems doomed before it starts.

This is not to say that the car is as yet untried. Prototype testing was carried out during the winter at Goodwood and Silverstone where creditable lap times were set by Roy Salvadori, Stirling Moss and Tony Brooks. David Brown now feels that the time has come to try the car in competition.

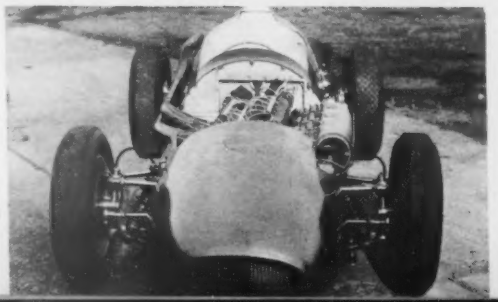
The car is powered by an aluminum six-cylinder in-line engine displacing 2½ liters. It has two overhead camshafts actuating valves that are inclined at a 95 degree included angle. Two KLG plugs per cylinder fire the mixture drawn through three dual-choke Weber carburetors. Magneto ignition is by Lucas. As on almost all British racing cars, a Marsten radiator and Hepolite pistons are used.

A Borg & Beck clutch transfers the power from the engine to the David Brown five-speed gearbox mounted in unit with the Z-F limited slip differential. Hardy Spicer joints are used in the drive train.

The chassis is a space frame made up of small diameter chrome-moly tubing. Front suspension is conventional independent using wishbones, coil springs, and telescopic shock absorbers. The De Dion rear end is sprung by longitudinal torsion bars and controlled by Armstrong telescopic shocks. Girling disc brakes are located outboard at all four wheels.

The car will be run on BP oil and fuel carried in Gallay tanks. To complete the accessory lineup, Smiths instruments and Avon tires are fitted.

Not at all radical in appearance, the Aston's smooth lines are broken only by the huge cold air box.



This photo clearly shows the angle of the engine and the cold air box on the three dual-choke Weber carburetors.

Multi-tube frame has one member that crosses the cockpit at the bottom of the dashboard. Shift lever connects to rear gearbox.

Wishbones, Armstrong shock, coil spring and Girling disk brake comprise front end. Stabilizer bar mounted to lower wishbone.

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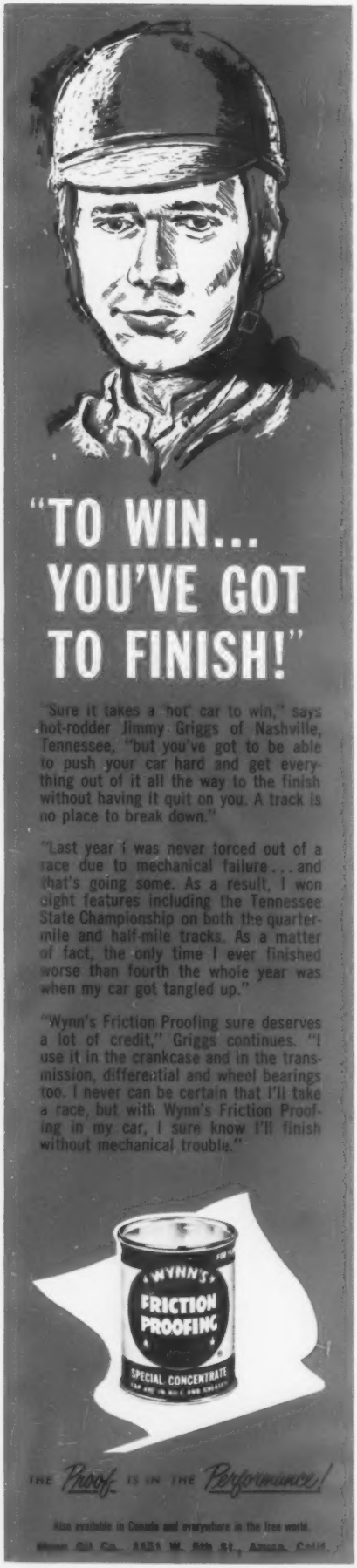
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"Wynn's Friction Proofing sure deserves a lot of credit," Griggs continues. "I use it in the crankcase and in the transmission, differential and wheel bearings too. I never can be certain that I'll take a race, but with Wynn's Friction Proofing in my car, I sure know I'll finish without mechanical trouble."
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Comments on Traffic

(Continued from page 47)

long it takes. But it strongly affects important decisions. It may be that he has a feeling of well-being when moving rapidly and one of intense irritation while sitting and staring at a red light. He may as a consequence decide not to live there after all. If he is typical, the five minutes delay, which means nothing as such to the individual driver and which is not very significant even when thousands of drivers are aggregated, may have a major effect on the society. Thus there is an apparently irrational factor which tends to increase the importance of speed. Or one may look on speed as a catalyst which triggers other forces. It has undoubtedly been strongly instrumental in developing our urban civilization. Unfortunately it is so sensitive a catalyst that the lawmaker who frames an unnecessarily inhibiting regulation, the local authority who installs two unnecessary, ill-timed traffic signals, or even the man who paints a white line on the highway in the wrong place, can inadvertently impose on the society a shocking loss. Of course *he* is never shocked because he doesn't know it happened.

I have belabored the subject in this fashion because I suspect that my viewpoint is not the conventional one among persons concerned with traffic safety. Yet it seems to me that a simple, direct approach to traffic safety is likely to lead to a misformulation of the problem, which in turn leads to solutions which do more harm than good.

— *THE IMPORTANCE OF TRAFFIC FLOW* —

If one recognizes that the central problem is to promote the smooth and rapid flow of lots of traffic, he is likely to devise measures which will in fact operate in this direction. And if it flows smoothly and rapidly it won't look like a battle field —it will probably have reasonable safety, which may even turn out to mean 100 deaths per day. At least we know that that is an attainable number when the utility of the automobile is large and even growing. The number of accidental deaths at the ends of the line, at home and at work, is also about 100 per day, so it isn't a unique hazard in our lives.

Some measures to promote the flow of traffic are obvious and others are only apparent after detailed and technical analysis. I can not resist mentioning a few which have occurred to me, though they are mostly obvious ones, and of uneven importance.

The one-way road is just very important. The question, "Is it needed here?" can probably always be answered "Yes" if there is any possibility of financing it. For the problems of operating our massive highway system well on roads where opposing streams must use the same lanes are just hopeless. The speed is often determined by the slowest vehicle, and an attempt to pass a slower vehicle is an especially hazardous operation which we are ill-equipped to perform. It requires estimates of the separation and of the closing speed between two vehicles (the one you want to pass and the one approaching, neither of which you control, and of the acceleration available in your vehicle. There is no reason to suppose that even a professional driver can consistently solve so difficult a problem accurately. It is a wonder that the death toll from head-on collisions alone is not much greater than 100 a day. It is not greater because the drivers want to live, so they tend to match their speeds to those of the slower vehicles. Thus the cost to society of two-way roads is vastly greater than one would infer from the death toll on them, even though that itself is relatively high.

The person concerned with hazards per se should note the special dangers of opposing streams even when there is no need to share a lane. Moderate ground speeds (e.g., 40 mph) produce ferocious closing speeds (e.g., 80 mph) and any human error or mechanical failure can lead to death in both streams. For comparison, if they are going in the same direction even at 80 mph, the closing speed is zero and the hazard due to the same errors and failures is completely confined to one stream and largely to one vehicle. Most of our modern highway design does not adequately reflect this point since it does not provide impenetrable barriers between opposing streams. I believe it is offered in defense of this design that roads with barriers have more accidents (as opposed to fatalities) than those without. This must be a reflection of the amount of space available for maneuver. If so, it is a cogent argument for making roads as wide as possible, but it isn't necessarily a compelling reason for sharing two busy roads.

There are important unsolved management problems regarding our roads. We have very rudimentary organization and means for coping with trouble. Anything from a vapor lock to a major accident can lead to a snarl tying up thousands of vehicles for hours. We need powerful means for unsnarling these knots quickly, even at the expense of deferring (and possibly compromising) the questions as to what happened and why. Lots of simple tow equipment and helicopter ambulances seem like natural tools. In fact the ubiquitous policeman could do more with a nylon tow rope than with his gun or notebook; I suppose he also has the authority to commandeer cars in the public interest.

The traffic light comes to mind; a useful device to promote the flow of cross traffic when the density on two roads is at a certain level. It isn't the best device for all levels of density and for all purposes. It is used indiscriminately for purposes deliberately inimicable to traffic flow. It should be harder to get a traffic-light license than a liquor license—the level of knowledge of a medical license sounds appropriate. And since they never seem to disappear, we need a man with the authority and responsibility to collect and junk unnecessary ones as if they were slot machines.

The situation at most light-controlled intersections—including the legitimate ones—is made unnecessarily bad by the fact that left turns are permitted. This operation has the potential of snarling two lanes of traffic and sometimes snarls all lanes. Why it is ever permitted except where traffic is negligible, I don't know. Requiring that the left-turner circle to the right, when that is possible, seems like a reasonable sacrifice for him to make for the common good.

(Continued on page 78)

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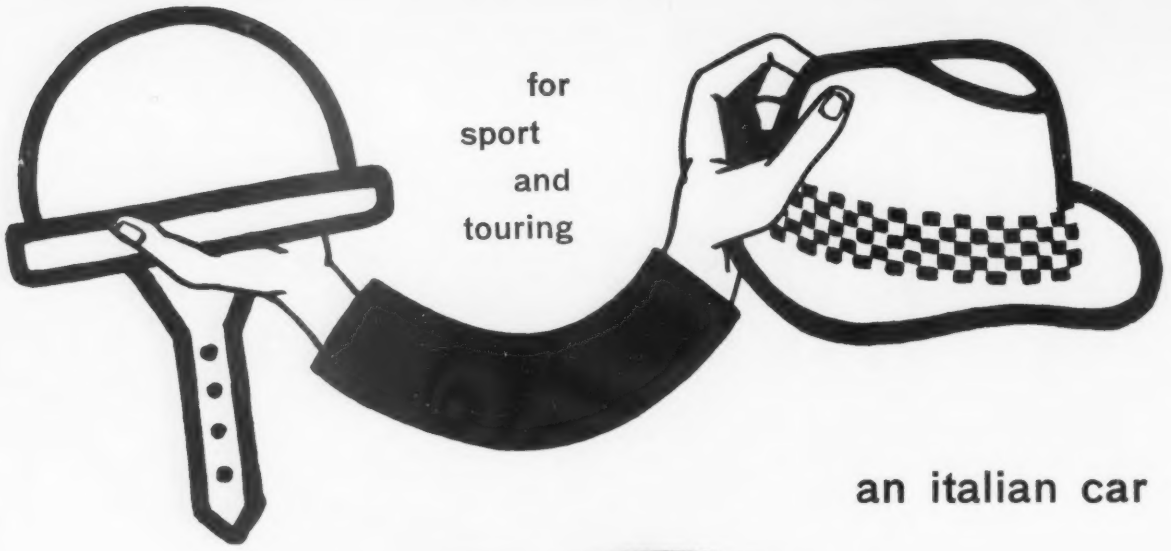

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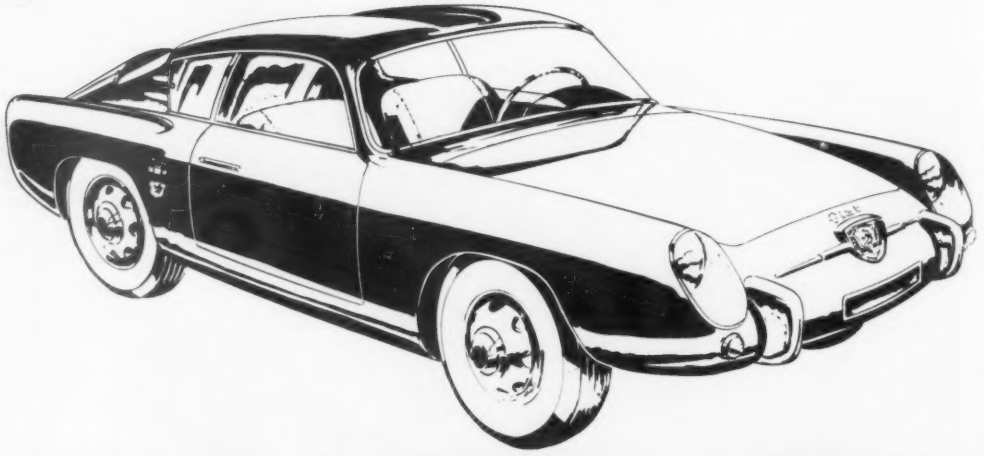

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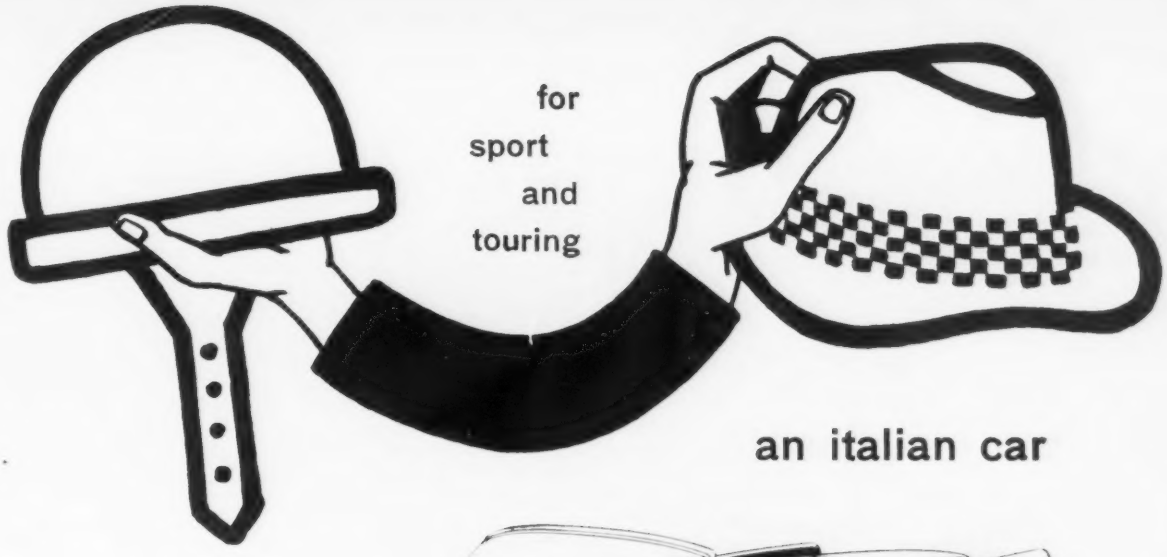

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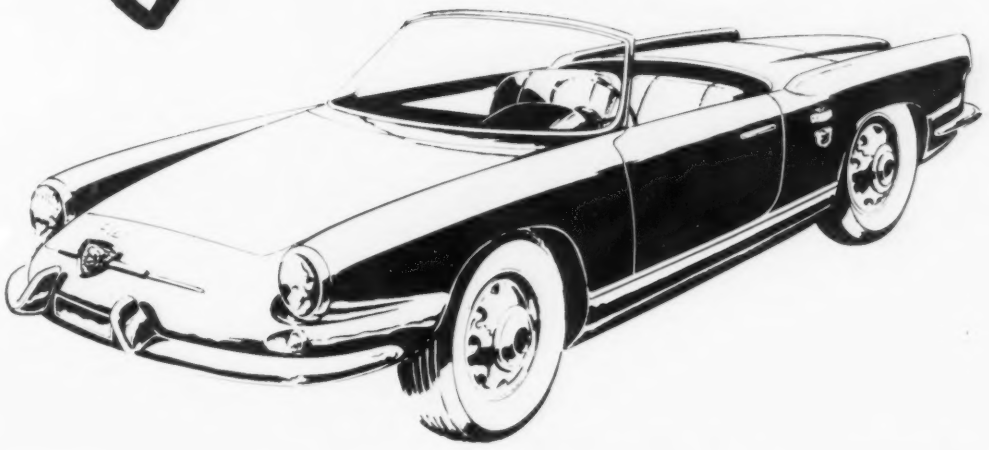

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Comments on Traffic

(Continued from page 74)

The situation regarding school zones has some of the elements of No Death Day—notably high emotional content and very little thoughtful reflection. Most of the time that vehicles spend crawling through upward of one hundred thousand school zones is useless ritual. Most of the time that children are at school they are required to be inside the school in fixed groups. Most of the time they are at school and outside the building they are in supervised play areas (fenced, or they should be fenced). They are safer from vehicles than at any other time in their waking lives no matter how fast the vehicles are moving. The time they need extra protection is during the periods they are in transit between home and school, so this is the problem to be solved. It is probably soluble in ways more useful to the society than posting school zones with extraordinary speed restrictions. Perhaps if the energy and money now spent on superfluous traffic lights were spent on school-crossing-in-use lights, the restrictions on the speed of vehicles could be confined to times when they could do some good. This is analogous to the railroad-grade-crossing signal, but a little better because the child has emergency capabilities not available to the train. The grade-crossing signal isn't a perfectly foolproof system but it is superior to the slow-for grade-crossing sign. The motorist knows when the danger is specific and imminent.

— *POSITIVE STEPS TOWARD SAFETY* —

I have argued that safety is a secondary matter from the viewpoint of society, which needs great mobility irrespective of safety—within wide limits. Safety is a nice thng to have in specific cases, but one can easily overdo its use—as in using our wonder drugs, one must not try to kill all the bugs. However, it is a legitimate personal concern for the individual and he may help himself do things which will ameliorate the dangers. He is unfortunately confused about some of the most useful measures available to him. For instance, he tends to regard seat belts (or, better, shoulder harnesses), crash helmets, and roll bars as the trademarks of a hair-brained driver, I suppose because they were invented for use in transparently dangerous situations. Actually they are required in those selfsame transparently dangerous situations at the insistence of the conservative driving element. The representative driver should become aware of the fact that driving even in the presence of his peers is dangerous enough to take his life, and that some of these simple devices may save it for him. In fact they are probably more useful to him than to the racing driver, because they are more likely to be effective in a low-speed crash than in a high-speed one. And even 20 mph has strong homicidal possibilities in a crash, for if the car loses this 30 feet/second speed almost instantly, the driver will travel three feet during the next one-tenth of a second, which is far enough to take him through the windshield or out the door. Their general use might reduce traffic deaths to half the present number.

The automobile manufacturers have not worked very hard at designing and stressing safety features. I suppose because one can't get the buyer too excited about such things unless one first stresses the hazards—which sounds like an unattractive way to induce people to buy and use automobiles. While I suspect the manufacturers' motives may be somewhat crass, the fact is that they have worked hard to place in the individual's hands a device (albeit a dangerous one) which makes him extremely mobile. For contrast, the constructive works of some organizations with impeccable motives are not always so obvious. The National Safety Council, for instance, may do all sorts of unpublicized good works. The only thing they are generally known for is their activity as spoilsports. On the formal holidays of our society they stand about declaiming the number who will be killed by automobiles, the implication being that if we would only be good children this wouldn't happen. I question the value of these warnings. They don't even have the professional merit of being difficult to make!

On the other hand, organizations like the National Safety Council could put on campaigns for shoulder harnesses, crash helmets, or any equipment which they feel is useful, aimed either at the individual or the manufacturer. Most campaigns now are based on nonsense premises, such as cut-down-the-horsepower-and-save-lives. These are groping attempts to place an absolute limit on speed, which, we have argued, is a strictly antisocial concept. Moreover, pretty silly attempts: it is surprising how few horsepower it takes to go 100 mph if you design for it. The principal function of lots of horsepower is to increase maneuverability, which may either increase or decrease safety in a specific instance, but which in general we should presume increases it; there must be some net advantage in having vehicles which will more often do *what* you want them to do *when* you want them to do it. On the other hand, who is urging the manufacturers to invent more advanced signaling equipment? The brake-operated rear light has been standard equipment for a third of a century, the turn indicator for a tenth of a century. Is that all? Automobiles make other speed changes which it would be useful to know about, as when the foot is lifted suddenly from the accelerator or the transmission downshifts. How about a reliable slowing-up light? Are there any utilities for car-borne radio, television, and radar, other than entertainment?

The motto of everyone concerned with traffic should be "Keep It Moving." The odds are that no matter what one does to that end, something good will come of it. The odds are that whatever one does which is contrary to the motto will have a detrimental effect in the large.

—*jdu*

Driving The MG Twin Cam

(Continued from page 63)

who came into it slowly and dug out faster than you did, he will be able to get up to a higher speed more rapidly on the straight (in an equal car), and will breeze right past you.

I have found that if I allow the MG to go no closer than 10-feet from the outside of the road coming out of the Hook (position #4) I automatically come into the straight properly positioned and at optimum speed. Then in the next instant—I have gone only about 10 or 12-feet past position #4—I give the steering wheel a slight twitch to the left, get off the throttle a hair and then stand on it hard. This action stops the car from sliding and it sort of "uncocks" it, eliminating the slight leaning angle to the left. Now (this is position #5) the wheels are pointed straight ahead and the car is pointed down the short straight and to the right-hand side of the road, just at the beginning of the next turn. Note that I do not have to steer the car across the road; it is already facing at a slight angle to the right from position #5. By the time I have reached point #6 I am only two or three-feet from the right side of the road, still going in a straight line.

After the short straight you encounter two long bends—the first to the left and the next to the right—known as the Esses. Only the left-hander is covered in our step-by-step diagrams—for reasons of space and because it is the more difficult of the two—but the right-hander is equally important and I will explain why in a moment.

The first turn in the Esses is difficult because it is a perfect example of a turn that is deliberately taken "wrong" to set the next one up "right." To explain this I will have to jump ahead to describe the approach for the right-hand part of the Esses. Remember I indicated earlier that your line through a corner is important mostly because it allows you to enter a straightaway following it at the highest possible speed. Well, there *is* a short straight section between the left and right sweeps of the Esses, but this is so short that unless we are properly set up coming out of the left-hander—that is, on the left side of the road at position #10—we will not be able to get into the right line for the right-hander. And if we don't go into this second curve properly we can't hope to come out "bombing" into the back stretch which, although it may look a bit twisty on the complete course diagram, is taken almost in a straight line.

Therefore we must "think ahead" and drive through the left-hand part of the Esses "wrong," or at least differently than we would if a long straightaway and not a right-hand bend followed. Instead of cutting to the extreme left at the apex of the turn and then allowing the car to slide to the right (the classic "outside-inside-outside") we must set up an artificial line that will bring us, with a minimum waste of time and engine revs, to the left side of the road at point #10. Here is how I do it.

At point #7 I am about one-foot from the edge of the road. Here I hit the brake slightly just to steady the car so that the tires will be on the biting side rather than the sliding side of traction. And since I do not want to let up on the throttle I usually touch the brake pedal with my left foot at this point. You might prefer to "heel and toe," but I find my method much easier although some practice is required before the move can be made naturally.

After I have applied the brakes I begin to steer slightly to the left, following the curvature of the road until, at point #8, I am about four to six-feet from the right side of the track (which, by the way, widens at this point). Right here I snap the steering wheel sharply (but only a couple of inches) to the left, at the same time applying more power. This throws the tail of the car abruptly out and, to a lesser degree, breaks traction on the front wheels as well. Thus, at position #9, I have "turned" a 45-degree corner that isn't actually there. This is the critical point in my artificial line. As soon as I have "thrown" the car I return the steering wheel to its original position (from point #7) and ease off slightly on the throttle. Again, as it was in the latter part of the Hook, the car is oversteering slightly and, as you can see from the overhead diagram, all I need do is to drive, almost in a straight line, to position #10, allowing the car to slide just

(Continued on page 98)

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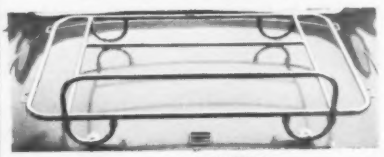

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Sebring

(Continued from page 23)

Sebring Conclusions

With five cars each in the top ten, Ferrari and Porsche enjoyed sweeping successes. Which all goes to prove that you can't beat a mix of numbers, quality and preparation. Not to mention good drivers.

Many complaints before and after race about quality of entries. Ulmann seems to be seeking as many makes as possible without much regard to driver experience or ability.

Ranks are filled by wealthy amateurs, often in cars with which they've had little if any experience. Like Le Mans, Sebring offers lots of prestige, little if any starting money. Few factories can afford the journey unless they sell their race car to a wealthy prospective entrant. Porsche and Ferrari each succeeded in attracting both money and skilful drivers to back up their three car works teams. Amongst other makes, the money and skill were only infrequently matched.

Debut of Elites was tarnished a bit by their late arrival. One finished second in class to Rainville-Kaplan in an Alfa, the other dropped out with engine mount problems. Though both turned faster laps than the Giulietta, longer pit stops told the story and the Conrero-prepared Alfa edged out the Lotus. Incidentally, at least one Alfa-Romeo entrant hid his specially obtained Conrero car away, came South with a very stock Super Spider. Result: not much at Sebring, but he says he's rarin' to go in the up-coming SCCA season.

Two-liter Lotus "Fifteen" impressed in practice. When it zipped by him, Holbert pitted his Porsche RSK for a quick engine check-up. "Thought it was an eleven-hundred."

Lou Delaney's crew changed a head gasket on Lotus-47 in a rain drenched three-hour stop. "Eventually, why not now?" Also involved in a long one was Ferrari-16. They swiped the necessary rear axle bits from George Arents faithful "Mimi," parked behind their pit.

Unconfirmed is the report that one of the Porsche mechanics is now recuperating from pneumonia. Seriously.

Chapman on racing car design: "Low weight for acceleration, low frontal area for speed, and low center of gravity for cornering ability. They all conflict with each other, and also it's certain that some body roll is desirable to inform the driver what's going on."

Considerable fracas between Ferrari team and the organizers. This year's regs did not actually require that entries use Amoco, apparently in response to Enzo Ferrari's statement that he wasn't racing where anybody told him what to put in his tanks. But Amoco, with lots of dough sunk in this project, didn't want the prospective winners using Shell — with whom Ferrari has a year-long contract.

Accidents were few but spectacular, especially Rollason's spin into the abutment of Martini-Rossi's vehicle bridge. Stanguellini was bent, literally, but driver wasn't even scratched. Less happy were the deaths of Edwin P. Lawrence (Maserati) and Gilbert Johnson (Ace-Bristol). Their crashes occurred in night practice at the hairpin turn and on the highway south of town, respectively.

Frank Roosevelt's team of Zagato-bodied Abarth-Fiats was indeed impressive. Four cars entered, all with bi-albero (twin cam) heads; plus four practice cars, one bi-albero and three push-rods. It may have been expensive but the results were satisfying.

Ditto for Bill Woodbury's management of the Ace-Bristols. They too had practice cars, one of which replaced the wrecked car mentioned above. When all was said and done, they had copped the Team Prize.

Larks

(Continued from page 39)

hand, features the now-typical American arrangement whereby the second seat folds forward, its two sections providing a flat extension of the rear floor and a protective wall just behind the front seat. The rear floor panel covers the spare and an ingenious but inexpensive hook holds it up when the jack or wheel are being removed.

Brakes, as to be expected on a car of moderate weight, have an easy job to do. Pedal pressure is medium and the brakes are capable of locking the wheels. Studebaker's interesting Hill-holder keeps the brakes on as long as the clutch pedal is all the way down—provided only that the Lark is headed up-hill. When reversing into a parking space under these conditions, it may be disengaged merely by placing the transmission in neutral.

Steering and handling, never exactly Studebaker strong points, seem to vary with the load being carried. Both Larks feel lively when light, becoming increasingly soggy as the load grows. Empty, the sedan maintained mild understeer right up to the ragged edge. Steering forces remained light, yet not so light as to hide the behavior of the front wheels. With heavier loads aboard, the major steering force in the six seemed to be mostly friction in the peg and sector steering box (the V-8 gets a roller and sector box which improves this facet of the problem). Both cars when heavily laden seemed uninspiring, even when just going straight down the turnpikes. Unladen, they were transformed into lively little devils that turned out to be much fun to drive. In this condition, their major drawback is the heavy proportion of unsprung mass involved in the rigid rear axle. Despite very good shock absorbers, the rather light Lark VI would pick up and skitter on some corduroy surfaces.

As the Europeans have shown, when you make a light car, the only way to get big car comfort on all roads is to incorporate independent suspension on all wheels. Easier said than done, unfortunately.

Sebring

MGA Twin Cam

(Continued from page 53)

Where once the best zero to 60 mph time we could get with the car was 9.7 seconds with more runs above 10 seconds than below, we now get nine seconds consistently and, even before final fine-tuning and with only some 600 miles on the engine we made one run at 8.9 seconds. The consensus at this writing is that these times will improve as the engine wears itself in. At the time of the 8.9 run, inspection of the plugs indicated that number one cylinder still hadn't run in completely.

Unfortunately, press-time came along before we had a chance to re-run the Lime Rock Park tests but the improved performance of the car in terms of sheer speed or rather acceleration indicate that another two to three seconds can be shaved from the lap times which would mean circuitry on the order of 1:17 with 1:16 a possibility if one were in a hurry and had the skill to handle the car at that rate.

Several knowledgeable people who drove the car in its former state have driven it in its current condition. One of these was Ed Brown who did the original gear changing. His comment was brief and to the point:

"It's a different car."

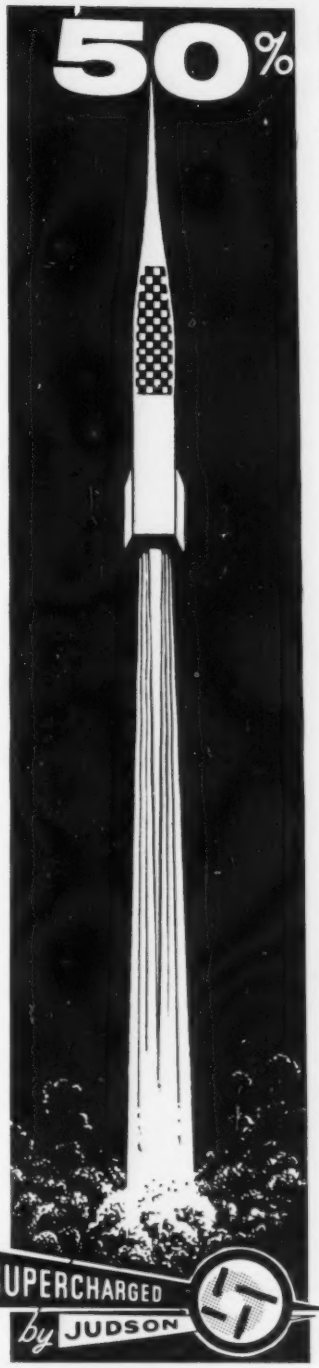
On one road in this area there is a long, straight 10 percent grade about half-a-mile in length. Starting up this hill in fourth at 60 mph, we were making about 75 at the top.

Only two faults have showed so far. One is a definite reluctance to leave the starting line, a problem caused by the close ratio gearbox in which low gear is about the same as second in a normal box. This can be overcome by leaving the line in a rush with a good chirp of rubber but such tactics are a bit difficult to use in traffic until one gets used to feathering throttle and clutch in just the right way. Once under way, however, the car moves off in a rush that is utterly satisfying. The other fault is one common to any engine with a relatively large port area, high overlap and normal carburetion instead of injection or a carburetor throat for each port. Idle, it will not, at least not under about 1200 rpm. Any idle speed under that produces the expected lumpy uneven chugging found in all very high performance engines. It's not a great fault and would be annoying only to those who expect all engines to tick over like Bentleys and Rolls Royces. Smooth idle is something only gained with cubic inches and mild timing, two traits the MG does not possess. It can be *made* to idle down to 700 or so but only by retarding the timing some 10 degrees, a practice which virtually guarantees holes in pistons so take warning.

In any case, the remark we made in our initial test report holds true in abundance. At that time we stated flatly that the potential of the car in class would be limited only by the man behind the wheel and the man in charge of the horses under the hood. The man in charge of the horses has come through—the machine *goes*. Now it's up to the man behind the wheel.

Also one other thing has been proved. Despite the necessity of using a production block as a base, the men behind the pencil and the drawing board knew what they were doing. This Midget is muscular indeed.

—john christy



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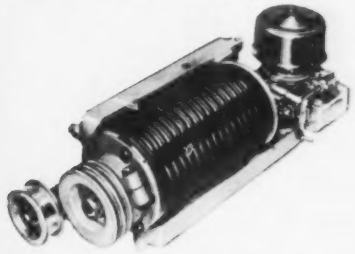

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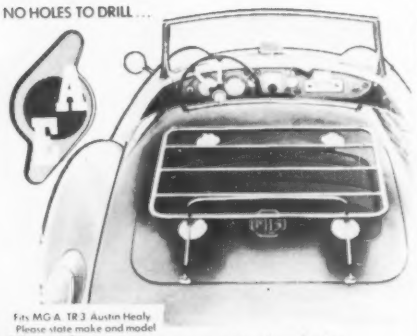

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Win By A Nose

(Continued from page 67)

copper-core goods tend to be very heavy. Don't use more than you absolutely need.

Air will be able to pass through the radiator core at a speed much slower than the general run of car speeds, and the actual area of core through which air can pass will be considerably less than the total radiator area. For both reasons it's not wise to expose the whole radiator to the onslaught of the atmosphere, current practice being to take air in through a small opening and lead it to the core. Judging by current examples, like the Lister, Vanwall and D-Type Jaguar, with good internal design you can get away with an aperture about one-third the size of the radiator.

"Good internal design" refers particularly to the position and angle of the duct walls between the opening and the radiator. First, if mechanically possible the opening should be dead on line with the center of the cooling core, to make maximum use of the air we have. The newest Lotus Grand Prix car has an air intake offset well to the lower edge of the radiator; its designer found that air wasn't finding its way up to the top of the core in any quantity, and inserted a deflector in the center of the intake to kick a breeze up that way. Many otherwise good designs are probably suffering from this same fault today.

Also it's important to have a *gradual* expansion of duct area from the air entry to the radiator, to prevent efficiency destroying turbulence from forming along the duct walls. When the D-Type Jaguar was first introduced, and in the later production editions, it had a shapely but short nose with rather severe (30 degrees on the top) duct wall angles. Later factory racing versions had a snout stretched 7½ inches, ostensibly for external streamlining but more importantly reducing the maximum duct angle to about ten degrees. The best "diffusion angle" is figured to be seven degrees, but space restrictions seldom allow this to be reached. Ten is plenty close.

Additional ducting will be needed to lead the warmed air away to the selected low-pressure points on the body surface. The cross-sectional area of the exit of this duct will want to be larger than the intake opening but not so big as the core — about half the core area should suffice. Again, the duct angles and curves should get the same attention you'd devote to the design of an intake manifold. There being no set spot on the body shell that always shows the lowest pressure readings — or the most suction, car builders have come up with a wide variety of interpretations.

In spite of limited space for air motion and the possibility of fluctuating high pressures, many designers have chosen to exhaust hot air on the underside of the (usually underpanned) body. Structurally this is one of the simplest layouts. The experienced aerodynamicist who planned the Vanwall and all the Lotus shapes plunked for the underside, using rounded ducts that curve sharply downward. Probably influenced by these examples are the similar ducts fitted to the Tojciro and the Tojeiro-designed AC-Bristol Prototype. Also in England good results were obtained on a downward-ducted special which cooled the water of a 50-horse engine with an oil cooler from a Junkers JU-88. Maserati has tried a lot of different ducted layouts, among them an underside exit on the offset cars built for Monza in 1956.

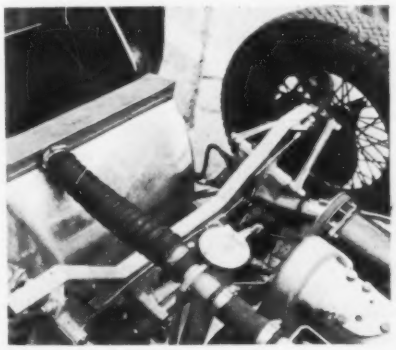
Earlier the same year Maserati built a G.P. car with an outlet on top of the hood, a pattern they've repeated on a small scale in their two new lightweight cars. Since high-pressure areas can exist on the top hood surface, some aerodynamic know-how is called for to make this work. Practical results indicate that a good exhaust point lies at a "break" in the nose profile that might occur where a rising nose curve flattens out into the hood proper. If there's no such point already, you can design one in as John Cooper did for his very neat rear-engined (but front-radiatored) sports cars. Top engineer Reid Railton used a louvered top exit on his then-sensational MG EX/135 streamliner of the Thirties, a pattern that was picked up by the similar EX 179. Right here at home a highly sophisticated ducted radiator was fitted to the one-shot SS Corvette, leading hot air up and out through long louvers.

Since there's often more extra room up front, rear-engined race cars are naturals for ducted cooling systems. I've already mentioned the Cooper, which used a top exhaust with its fully-enclosed bodywork. Back in 1934 the open-wheeled rear-engined Auto-Union juggernauts appeared with hot air exits on the *sides* of the stumpy hood. The same idea, more closely integrated with the openings for the suspension arms, was to be found on the new '38 model of the same car. An Auto-Unionesque postwar Grand Prix car, the Sacha-Gordine featured two separate radiators for oil and water with ducted air exits at the suspension openings. Although front-engined, the latest BRM G.P. machine achieved similar results with a radiator divided into two cores with common top and bottom tanks. Simple vertical deflectors pushed air out the sides, leaving a central opening which could supply cool air to the carbs, engine room or an oil cooler to choice. Recent frame changes have left this central supply unchanged but have forced the removal of the deflectors.

Many systems remain that can't easily be categorized as having bottom, top or side air exits. One such is the MG EX 181, mentioned earlier, which uses two completely separate systems breathing the absolute minimum volume of air. The twin-radiator idea can be neatly applied to many car design problems, as the Marchese brothers did with a prewar Indy car that had to meet the new minimum-width regulations. They filled out the flanks with radiators slung from frame members, leaving the nose smooth and pointed. No air entered the snout of the first Vanwall Special either, the heat exchanger being a network of grilled tubes laid out on the upper front of the body. Reminiscent of 1905 techniques, this rig worked well but was replaced by a conventional radiator as a precautionary measure before a race in sunny Italy, and was never reinstalled. Another early-day technique that might take to rejuvenation was the mounting of a cowled radiator ahead of an enclosed, streamlined body

nose, with enough space in between to allow air to escape freely. Executed on the "Duck" racing Austins and some of Malcolm Campbell's Bluebirds, this is really an exposed harbinger of modern ducted layouts.

The same general principles of duct design can also be applied to other car cooling problems, most directly of course to the feeding of an oil cooler. Mercedes have published some remarkable figures on their 300SLR which indicate just how hard it is to get very low air resistance with a practical road racing car. I already mentioned that 15 to 18 percent of air drag was supplied by the joint air and water cooling systems. An additional five percent was soaked up by openings to cool the driver and the tires, and a further four percent by access holes in the belly pan. They reiterate that, as in the case of their W163, as the frontal area is reduced the share of drag produced by these necessary openings becomes greater — and thus more worthy of good detail treatment. —*kl*



Downward exhausting radiator system on Tojeiro sports car requires placing ducting, radiator core, and vent ahead of the front crossmember.

The more specialized a car is, the more highly developed its cooling system can be. Ducting and core area in the EX 181 or any Bonneville streamliner can be laid out to the last hair, while at the other extreme experienced sports car builders like Maserati and Ferrari have to cope with countless combinations of speed and climate, and prefer to lay on as much core and opening as they think the market will stand, perhaps supplying an adjustable blind so you can keep the radiator from freezing up on the downhill runs. Mercedes overcooled the 300SLR for the same reason, compensating with a thermostat instead of a blind. In between these extremes lie the bulk of competition and street equipment. Not one, no matter how far out, has any claim to the term "aerodynamic" unless the streamlines were designed from the inside out.

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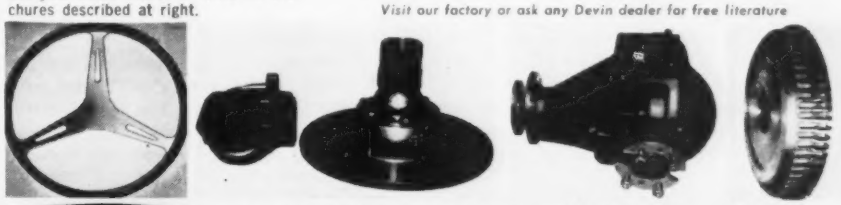

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Prescription For Performance

(Continued from page 45)

the usual run-of-the-mill types. For our purpose, using gasoline, an honest measured compression ratio between 10¾ and 11¼ to 1 is most desirable. Variations in bore and stroke will, of course, effect the overall compression ratio, as will the removal of metal from the combustion chamber. Chev heads can be milled, or preferably ground, a maximum of .060-in. without fear of structural weakening. Don't hesitate to grind the heads enough to bring the compression ratio within the above limits. There are two "don'ts" in connection with the compression ratio. The first, previously mentioned, is the desirability of using flat top pistons. Domed pistons should be used only if the compression ratio cannot be raised sufficiently by any other means for the displacement of the engine. The second is to make absolutely certain that the depth of the "squish-quench" area does not exceed .060-in. and is preferably closer to .050-in. with the piston at exact top center. This is the distance between the flat surface of the head and the top of the piston opposite. A depth in excess of 1/16-in. is asking for detonation with an engraved invitation. Closer clearances are possible but when they approach .040-in., there is a good chance of mechanical interference between the piston and the head at high engine speeds. The connecting rods and pistons actually and measurably stretch and the tighter the engine is twisted, the more they stretch. So keep the piston-to-head clearance as close to .050-in. as possible.

A compression ratio of 11¼ to 1 with a clean combustion chamber, contingent upon the above, is entirely free from detonation with the best pump gasolines at all engine speed and load conditions. Twelve to one is definitely on the ragged edge of detonation at full load and 12½ to 1 is over the hill. Combustion chamber deposits that inevitably form and cling to chamber surfaces effectively lower the highest useful compression ratio. We must take this into consideration and limit the maximum compression ratio to 11¼ to 1, even though the engine will be disassembled and the combustion chambers cleaned quite frequently. Compression ratios from 9¼ to 9½ to 1 are about right for supercharged engines with low boost pressures (10 psi or less). For higher boost pressures, ratio of from 8 to 8½ to 1 are about as high as practicable. The latter cases usually require that '57 265-cubic-inch truck heads be used. These have a compression ratio of 8 to 1 and also have the larger Corvette-sized intake ports.

There are three different head gaskets that may be used; the stock '57 and later Chev embossed steel gasket, the Fitzgerald 0622 steel-asbestos gasket for bore sizes up to 3⅞-inches and the Fitzgerald 0622-4-inch special steel-asbestos gasket for bore sizes larger than 3⅞-inches. If the head and block surfaces are smoothly ground and the gaskets are properly installed with the heads torqued to 75 pounds-feet, there should be no sealing problems. However, the Fitzgerald gaskets present no thin metal edge to the combustion chamber so there is much less chance of hot-spotting from this source, as has been known to occur with stock Chev gaskets. The compressed thickness of the Fitzgerald gasket is about .050-in., which means that to maintain the proper depth of the "squish-quench" area, the tops of the pistons must come exactly flush with the top of the block at top center. Use the "silver paint" method of gasket sealing described last month.

A heavily supercharged engine brings its own particular gasket problems. Because of very high cylinder pressures, any normal head gasket will eventually blow or at least leak. About the best plan is to use the stock Chev gasket and carefully round off the projecting edges. Carefully solder a length of .030 in. diameter copper wire to the underside of the embossed ridge that circles the combustion chamber; that is, in the groove formed by the embossing ridge. If this job is done properly, the gasket seal will last a surprisingly long time unless a section of the copper wire melts, at which time there is greater trouble elsewhere.

Measuring the compression ratio, with the engine fully assembled, is the only accurate way to know the actual ratio. Because compression ratio is strictly a mechanical function between the volume of the combustion chamber and the volume of the cylinder, a compression pressure gauge is useless. Knowing the bore and stroke, calculate the displacement of one cylinder in cubic inches, then convert it to cubic centimeters by multiplying by 16.38. Use a dial indicator to bring one piston to exact top center of the compression stroke so both valves will be closed. Use a narrow strip of masking tape to seal the gap between the piston and the bore. Install the head gasket and head. Tilt the engine so the spark plug hole is vertical. Fill a 100 cc or larger beaker with SAT 10 oil and record the exact amount used. Fill the combustion chamber up to the second plug thread with oil from the beaker. Rock the engine back and forth to remove all trapped air and refill the chamber to the second plug thread. Record the amount of oil used to fill the chamber by subtracting the remainder from the original amount. Designating the displacement of one cylinder in cc's as V and the volume of the combustion chamber as v, calculate the compression ratio by the formula $\frac{V+v}{v}=CR$.

The matter of compression ratio is of the utmost importance to our engine. An insufficient ratio is wasting the potential of the engine. Too much is encouraging blow-ups. Thus a middle-of-the-road policy is in order here; a ratio high enough for the development of good power and torque but not so high as to induce detonation or endanger engine reliability.

CAMSHAFTS AND VALVE GEAR

Without a doubt, the patented General Motors system of pushrods and rocker arms, as exemplified by both Chevrolet and Pontiac V8's, is the very best in the world. The entire layout is simple, very light in reciprocating weight, rugged, extremely durable and is capable of taking the engine up to astronomical revolutions. In fact, there are at least two other Chev hydroplane engine about that run at maximum engine speeds of very close to 10,000 RPM. Of course, the horsepower is down the drain at these speeds but the point it that the rocker arms and pushrods are stock Chev items. There is only one improvement to be made to the rocker arm department and it involves the rocker arm stud. First, place a straightedge along the row of rocker studs. The highest studs should be pressed into the head further to match the height of the lowest studs. The correct dimension is 1⅜-in. from the top of the stud boss to the top of the stud. The stud bosses and the studs themselves should be drilled for small taper pins or a 1/16-in. diameter Rollpin. The pins will keep the studs from raising in the event of piston-to-valve interference. Valve guide bores should definitely be knurled for reasonable oil control. Also, the valve stems should be grooved for the stock Chev "O" ring oil seals and, if possible, the stock inverted steel cups should be retained.

For our modified engine, the sky is literally the limit in the field of camshafts. Just about every type, except desmodromic, is available for the Chev; there are cams for flat lifters, radiused lifters, mushroom lifters, roller lifters, etc., ad nausium. Choosing the correct cam for a particular engine size and with a specific job in mind isn't, or shouldn't be, as simple as closing your eyes and pointing. All too often, the cam chosen for a specific purpose can never reconcile itself with the purpose because the buyer has been somehow misled or misinformed. Again, all too often, the importance of the torque curve is either minimized or overlooked completely while concentrating on top end power. A camshaft must perform two basic functions: It must provide the maximum possible power and torque in the speed ranges where they are most needed. And it must do so for extended periods without wearing out and without causing undue hardships on the rest of the valve gear.

Maximum top end power and maximum mid-range torque, while not exactly polar opposites are nevertheless not quite compatible because obtaining one usually involves sacrificing the other. To cite an example, the 339-cubic-inch Chevs used in the Reventlow Scarabs are quite capable of producing an honest 390 bhp at around 7000 Rpm with a cam ground strictly for top end operation having close to 300 degrees duration. This was tried on one occasion on the dyno but the results were dismal indeed in the low and mid-ranges. The camshafts eventually chosen for all the Chev engines were considerably milder in valve timing, having a duration of 270 degrees and a net valve lift of .432-in. This cam produced excellent mid-range torque, 370 pounds-feet at 4500 RPM, together with the very acceptable figure of 375 bhp at 6000 RPM. Thus, by sacrificing less than four percent in top end power, the engines were extremely strong over a very broad range — from 3000 to 7000 RPM — rather than in the relatively narrow top

end range from 5000 to 7500 RPM, as produced by the long duration cam.

For a smaller engine, from 265 to 283 cubic inches, the 270 degree cam reacts in a manner quite similar to the 300 degree cam in the larger engine. In other words, in a practical sense, the 279 degree type is too much cam for the smaller engines. To duplicate the general characteristics of the larger engines with a small engine, that is, good torque over a broad range coupled with good power on the top end, requires an effective duration of about 260 degrees. The 300 degree cam in a small engine will lose a significant amount of power all the way up the line until close to 7000 RPM is reached, which is completely out of sight and not acceptable. On the other hand, the 260 degree cam in the large engine brings the torque up to a most admirable figure at 4000 RPM but at the expense of the top end. Therefore, the most active engine speed range is reduced to about 2600 to 6000 RPM. This, too, is not acceptable because it was proven on several occasions that during a running lap on a road racing course the engine speed rarely fell below 4000 RPM and never below 3500 RPM.

These examples emphasize the importance of selecting a camshaft that will produce a high degree of engine flexibility. As a general rule, the engine should become quite strong at about 15 to 20 percent below maximum torque peaking speed and stay strong until the engine is about 10 to 15 percent past the maximum power peaking speed. From the standpoint of available power, once an engine reaches the peak power speed, any increase in speed will show a decrease of power. Therefore, if maximum power is reached at 6000 RPM, there is absolutely no purpose in turning the engine 8000 RPM; 6500 yes, and perhaps 7000 in a pinch. About the only exception to this rule is in a direct drive boat where boat speed is more-or-less proportional to the number of revolutions turned by the propeller. It is, however, very convenient to have a "cushion" in hand as far as maximum engine speed is concerned. It is especially important to the engine in the event of missed shifts or other forms of unintentional over-revving so that the valves are not floated. Valve float is very destructive to every part of the valve train. Prolonged valve float in a Chev engine greatly multiplies the possibility of collision between the pistons and the valves, even though the pistons are notched for a reasonable clearance.

So choose the type of camshaft for your engine very carefully. Special camshafts and related components are not cheap and mistakes are usually considerably more expensive than the cost of the cam. If it is financially possible, two or more special cam types should be tried. It is sometimes advisable to switch cams for different types of courses; a longer duration cam for longer and faster courses and a short duration high torque cam for shorter courses. The standard Chev Duntov cam is definitely out of sorts in a modified engine. It has neither the potential for good torque nor top end power in spite of its fairly good top end characteristics in a stock engine.

(Continued on page 86)

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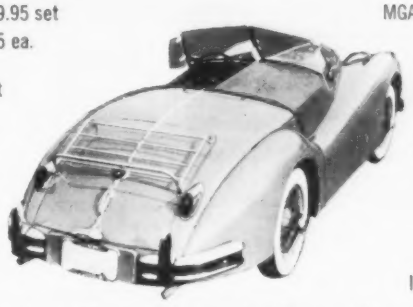

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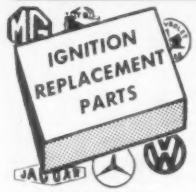

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Prescription For Performance

(Continued from page 85)

Usually all the essential items for the correct installation and operation of the valve gear is included in an installation kit along with the cam itself. These pieces include the lifters and lifter buttons, inner and outer valve springs, spring retainers, etc. For the most satisfactory results, install all the pieces according to instructions first, and experiment later. The stock rocker arms and pushrods are fine so leave 'em alone unless it is essential to the cam installation that they be replaced.

A valve timing check is absolutely essential after the camshaft and related components have been installed because of excessive production tolerances found in Chev timing sprockets, crankshafts, etc. The procedure was outlined in the previous articles, as were the corrective measures.

IGNITION SYSTEM

Here, the best place to start is to throw the stock ignition unit as far away as possible. Or smash it to small bits with a large hammer. When it is gone, the temptation to use it will also be gone. As stated last month, the stock Chev Delco unit is barely, just barely, capable of firing the mixture charge of a good stock engine. Load additional power into the engine and the stock ignition simply can't, and won't, do the job. Additional electrical resistance at the spark plug electrodes, in the form of higher cylinder pressures developed by the modification process, is enough to defeat the stock unit. All it takes is additional compression, a good cam, a good exhaust system and an increase in carburetion in an otherwise stock engine. The most common reply to this handy bit of information is "But I've just had it strobe-tested to 8000 RPM!" Which doesn't prove one single, solitary thing because in a strobe-test, the ignition is running free with no electrical loads imposed upon it. The stock Chev passenger car or Corvette ignition is treacherous and cannot be trusted in a modified engine. Throw it away. Give it away. Melt it up for horse shoes. Get rid of it.

The two types of special ignition units that will do the job at hand, dual-coil battery or magneto, are available from several different sources. Each has its own advantages and disadvantages. While the driving requirement of the dual-coil battery type is very low in power absorbed from the engine, it does require a good battery, generator, voltage regulator, two good ignition coils, etc., in order to function in an efficient manner over long periods. On the other hand, a magneto requires considerably more power to drive and they can be, but needn't be, a bit difficult to start. However, the magneto is a completely self-contained electrical generating plant for the ignition system. In the event that the battery falls off or explodes, or the fan belt breaks, or the generator or regulator goes up in smoke, or any one of a combination of many forms of electrickery, the engine will keep running and you can press on regardless. The crew of the Reventlow Scarabs are frightened silly of V-belts and the possible breakage of same. Accordingly, they had special timing cover castings made up with a positive dog-type drive from the nose of the camshaft. A special gearbox bolts to the front cover casting which drives the water pump and the magneto. The solitary V-belt on the car drives only the generator and, if this breaks, it is of no particular significance to the continued operation of the car. Quite expensive but very effective.

The matter of spark advance is another factor to which the Chev engine is extremely sensitive. For the best of sustained performance, this can never be a hit-or-miss proposition. The practice of tuning an engine by ear should be banned forever. The spark advance curve, which is controlled by a system of centrifugal weights and springs and not by manifold or venturi vacuum, should be 15-ignition-degrees in length for a modified unblown engine. The shape of the curve must closely resemble that of a late fuel injection Corvette. The 15-ignition-degrees is equivalent to 30-crankshaft-degrees. With ignition fully advanced, again discounting vacuum, and with 10¾ to 11¼ to 1 compression ratio, maximum permissible spark advance must not exceed 45-crankshaft-degrees and preferably 42-crankshaft-degrees. A 15-degree advance curve (30-crankshaft-degrees) produces a total of 42-crankshaft-degrees when the ignition is set to fire at 12-crank-degrees BTC at idle speed. Initial settings in advance of 12-degrees BTC make starting difficult and low speed operation a bit rough. Initial advance is most accurately set with the aid of a good timing light with the engine idling at 800 RPM or less. Tuning requirements for individual engines may make changes in the above figures necessary for different race courses and weather conditions but they represent a good place to start.

Dual-coil battery ignitions are available with or without a vacuum advance diaphragm. For racing, the additional spark advance at fairly high vacuum indications is not necessary. When the throttle is open and manifold vacuum is below about seven-inches of mercury, the vacuum advance unit is inoperative and when the throttle is closed, it doesn't make a great deal of difference where the spark advance is as long as it's within reason. However for general use, the vacuum booster advance should be used to provide easier starting, generally cleaner and sharper part-throttle operation as well as a measurable improvement in fuel economy. The additional spark advance supplied by the booster should be limited to between six or seven-ignition-degrees, or 12 to 14-crank-degrees.

The ignition wiring must be put together with a firm resolve that it won't fall apart under rough conditions. All primary terminal connections must be made with spring lockwashers and double nuts. Run a 12 gauge wire from the ignition case to the ground terminal on the battery — if a battery ignition is used. This will increase breaker point life very considerably. Secondary plug and coil cables must be secured as tightly as possible at each end. Spark plug connectors must be well shielded to prevent arcing over to the nearby exhaust headers. The connector

must be a good tight fit over the end of the plug to prevent falling off at awkward moments. '51 or '56 Chrysler V8 ceramic plug shields are fine. Lodge makes a good neoprene insulator but about the best of the lot can be filched from a Volkswagen. Good quality plug cable is a must and, if possible, the wire strands should be soldered to the distributor cap clips and to the plug connectors. Cables must be routed as far away as possible from the exhaust headers and other sources of heat. They must also be separated from each other to prevent "cross-firing", a phenomenon that has destroyed more than one engine. The idea of taping the cables together into a tidy package is out. Plug cables should be renewed occasionally because they can and do become "tired", causing mysterious ignition ailments under heavy loads and high engine speeds and which are almost impossible to diagnose accurately.

About the most suitable spark plug for our engine is the Champion J-63R racing plug for competition events. Racing Champions have the ground electrodes pressed into the shell, through the threads, and are much less apt to give trouble from ground electrode overheating, as in standard commercial types. The workmanship is also very much better and consequently the price is higher. The plugs should either be soaked in lacquer thinner or dipped for a few minutes in a degreasing tank then lightly sandblasted after each racing session. In cleaning plugs, every effort should be made to dig out every last particle of abrasive sand. New plugs for every race meet is not at all necessary. If the heat range is right and if they are cleaned thoroughly and frequently, plugs will last much longer than you would imagine. The J-63R's may be a bit cool for cold starts and even if they aren't, it's a good plan to use a set of J-6J's for warm-up purposes, provided no "hot laps" are taken with them. For the best heat transfer, plug threads and the plug holes in the heads must be kept clean and a good supply of new plug gaskets must be on hand. J-63R's should be gapped to .020 in. for long, fast races and to .025 to .028 in. for slower events. This is easily done with a special ring type gapping tool available from Champion.

For general use, Champion J-6J's will work quite well in modified Chevs. Gap should be .033 in. for average driving conditions. Again, plugs should be cleaned frequently, about every 1200 or 1500 miles for best performance.

In both stock and modified Chevs, plugs have strong tendencies to become oil-fouled party because of the plug location in the combustion chamber and the fact that the plugs are on a horizontal plane, making it difficult for oil in the plugs to drain back into the chambers before it becomes baked onto the insulators and shells. The condition is not helped at all by excess oil that flows down the valve guide bores. Lubrication of the Chev topside valve gear is many times more than adequate. It is in this area that we can forestall a portion of the plug oiling problem. Stock Chev "O" ring oil seals must be used on the valve stems. If single valve springs are installed, use '54 to '57 Ford-Merc neoprene "um-

(Continued on page 88)

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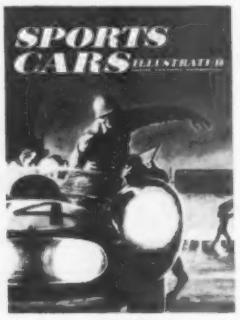

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Prescription For Performance

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brellas" on the valve stems below the spring retainers. These must be trimmed to clear the inside diameter of the springs. Use the stock Chev inverted steel cups (Chev part number 3836755) between the tops of the springs and the retainers if at all possible. These must be heated to a bright red and cooled slowly in air to prevent cracking and breakage at high engine speeds. If the lifters have two oil holes in the lifter body, one hole should be plugged with an aluminum rivet, carefully filing off the excess so the lifter will fit properly in the lifter bore. And, above all, knurl the valve guide bores. This operation in itself will reduce the oil flow past the guides into the combustion chambers by more than half. When all else fails, install new piston rings. If severe pug oiling exists, as it does in a great many Chev engines, it usually takes most of the above refinements to reduce the flood to a more sensible trickle and once the corrective measures have been applied, plug oiling will cease to be a problem.

INDUCTION SYSTEMS

As everyone knows, the variety of special induction systems available for Chevs is practically limitless. There are manifolds for three, four, six and eight dual-throat carburetors as well as the stock 270 type rig for dual four-barrels. There is the stock Chev-Rochester fuel injection and a new, improved model of the Hilborn injector. All of these, plus a new one, as yet unreleased, that should work better than anything yet with the possible exception of the Hilborn unit.

The new air-bleed Hilborn injector, together with the new and larger 1 13/16-in. diameter throttle bores, is currently the undisputed best for top end power developed at higher-than-carbureted engine speeds. The 1 13/16-in. throttle bores are best suited for larger bored and stroked engines, while the "standard" 1¾-in. model improves flexibility and all around usefulness of the smaller engines. The Hilborn is not without penalties. First, it's strictly for racing and is quite expensive. Second, it requires a good basic knowledge of the unit, plus a certain amount of driver education, to make it function as it should. During full throttle operation at lower speeds, the air/fuel mixture ratio is inherently very rich, and doesn't begin to lean out toward more digestible ratios until about 4000 to 4500 RPM. Once the idiosyncrasies are understood and the basic adjustments are made, variations in mixture ratio are the simplest and quickest ever. The new air-bleed injector nozzle heads are a great improvement in idling charcteristics and response to part-throttle operation. The Hilborn also makes ram tuning a very straight-forward and relatively simple proposition.

The next best bet for a large engine is a six carburetor double-log intake manifold. Actually, these manifolds can be used to good advantage on any engine from 283 cubic inches on up by the simple expedient of using larger or smaller carburetors. Six '56 Ford-Holley two-throat carburetors, each with a pair of 1 1/16-in. diameter venturii, are most suitable for the engines in the 324 to 351 cubic inch range. These are excellent carburetors and can be used in completely stock condition, the only exception being minor (usually .001 to .002 in. larger or smaller) corrections to the main metering jets. Smaller engines require less venturii area and here the carburetor to use is the late Stromberg EE-1. This is a replacement for the '49 to '53 Ford-Holley. It contains two 13/16-in. diameter venturii and an intermediate jet that greatly improves part-throttle operation. With good carburetors of the right size properly and identically rebuilt, and with a good throttle linkage arrangement, this type of manifold will produce excellent throttle response in all speed ranges, excellent torque characteristics and acceptable top end power. If the carburetor float levels are set from 1/32 to 1/16-in. lower than stock specs, the engine will be as sharp through turns as it is on the straights. For obvious reasons, this type of manifold is recommended for competition engines only and is not for street use. Attempts at ram tuning with this type of manifold are a complete waste of time. It won't work because it can't work. With this manifold and the correct carburetor size, maximum power will be down from 10 to 20 bhp, as compared to the Hilborn injector.

The staggered four dual-throat carburetor manifold represents a transition between those for street use and those for racing. Correctly applied, this manifold is fine for the smaller Chev engines but requires fair-sized carburetors like the '56 Ford-Holley to do the job, particularly in the higher speed ranges. Again, not too suitable for street use and no ram tuning benefits.

Dual four-barrel carburetors and manifolds are best left on stock Corvettes. The carburetors can be made to function properly but they lose their edge rather quickly and are generally a nuisance to work on. Besides, they are certainly not at all the best for street use and the top end power is down a considerable margin from those types discussed.

By far the best induction system for a street machine is the Chev-Rochester fuel injector. And they are by far the most expensive for the purpose. A large, well modified bored and stroked Chev engine with the late Rochester injector, suitably recalibrated for the increase in displacement, represents a combination that is extremely difficult to improve upon. It is very flexible, smooth, it idles well, it is economical to operate and throttle response is immediate and razor sharp. Even from 1000 RPM in high gear, the part- or full-throttle torque produced by such a combination is very impressive indeed. However, the Rochester injector is not well suited for racing with a modified engine because air flow restrictions within the unit severely limit maximum power.

Next best in the street category is the balanced triple manifold using three dual-throat carburetors. For the best overall results, progressive linkage is highly advisable. Carburetors should be either Chev-Rochesters with 1 3/32-in. diameter venturii for smaller engines or the Stromberg replacement for these same Rochesters. The Strombergs have 1 3/16-in. diameter

venturii and work better with larger engines.

While we are on the subject, it seems advisable to point out that the ancient Stromberg 97, 48 and 81 carburetors (?) are best left to those who wish to convert them for alcohol and nitrated fuels. While they may (or may not) have been acceptable by standards 20 years or more ago, they must now be regarded as anachronistic throwbacks to the automotive dark ages. Merely because they are plentiful and cheap are certainly no recommendations to use them on an otherwise good engine when they aren't fit for use on a stock wheelbarrow. On the contrary, their availability and low price seems to indicate that, finally, after 24 years they might just possibly be going out of favor. Hooray!!

Under certain favorable conditions, the Chev engine is quite receptive to ram tuning. Of course, the most advantageous condition is an individual fuel and air supply for each cylinder, isolated from those of other cylinders by interconnecting passages, as typified by the Hilborn injector. The Hilborn has the distinct advantage of short risers in the throttle body castings, which permit experiments to be carried out over a very broad speed range. The Chev responds nobly to variations in ram tube length, the longer tubes increasing the torque while shorter tubes increase top end power, just like the book says they should. The power increase on the top end, due solely to ram tuning, is usually worth about three percent, or about 12 bhp at 6000 RPM for a large engine and about nine or ten bhp between 6500 and 7000 RPM for a small engine. With the Reventlow Scarab Chevs, some tests were run on the dyno to see if maximum power and maximum benefit from ramming could possibly occur at the same engine speed without violating a clean hood line. Everything fell together very nicely. Maximum power was obtained at 6000 RPM, which required a ram tube length of 10¼-in. measured from the top of the bell-mouthed tube to the head of the intake valve. It is interesting to note that this distance, plus the crankshaft stroke, plus the ¼-in. from the valve head to the top of the piston at top center, comes within 1½-in. of that recommended by Colin Campbell in his book "The Sports Car".

Strange as it may seem, a balanced triple manifold and the stock dual four-barrel manifold can both be ram tuned to a certain extent. The passage lengths in both manifolds and the height of the carburetors eliminate the possibility of ram tuning for maximum power but the ram tube length can be made to resonate satisfactorily at maximum torque peaking speed. The trick with the triple is to make the ram tubes over the carburetors two inches shorter for the center carburetor than for the end ones. Less effective but still measurable, ramming the dual four-barrel requires very large diameter ram tubes, which are not as efficient as small ones in reflecting resonant pulses.

Effective valve timing, ram tube length and diameter are the three most important factors in induction ram tuning, together with a suitable induction system. These three variables encourage individual ex-

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Prescription For Performance

(Continued from page 89)

periments for the most effective overall results. About the only penalty one must pay for reasonably efficient induction ram tuning is a slightly higher fuel consumption but no more than is necessary to offset the power gain. Ramming a Chev upsets the most popular conception of induction ram tuning which seems to be that the benefits of ramming are pinpointed within a very narrow engine speed range. This may be true with some types of combustion chambers but with a Chev rammed for 6000 RPM, the effects become distinct at about 5000, strongest at 6000 and fade off at about 6800 RPM. This is a considerably wider range than is generally believed to be possible.

EXHAUST SYSTEM

An efficient exhaust system does much more than expel burned gases and make noise. As explained earlier, long valve overlap periods are out of place in a Chev so far as any reasonable scavenging effect is concerned. A good substitute for cylinder scavenging is an exhaust system that makes the most of the inertia of the departing gases to draw out the exhaust gases that ordinarily remain, and to induce the incoming air/fuel mixture charge into the cylinder at a faster rate. To accomplish this most efficiently, the exhaust system, like the induction system, must be tuned for the effective valve timing and the length and diameter of the pipe used. A photo shows the exhaust layout used on the Scarabs, which was the result of a great amount of experimenting. The individual pipe length from the header flange to the point where it joins the collector pipe is 32 inches. This length plus three inches from the header flange to the top of the piston at top center also agrees with Colin Campbell's figures for maximum ram effect at 6000 RPM within one inch, which seems somewhat more than mere coincidence. Pipe diameter is 1 11/16-in. inside. Both larger and smaller diameter pipes were tried but the 1 11/16-in. diameter (1¾-in. outside diameter) proved most effective. The collector pipe is 43-in. long is is 3-in. inside diameter. Engine performance was measurably better with the collector pipe than without it. This exhaust system gained 12 bhp at 6000 RPM over the next best layout and about 30 bhp at the same RPM over the worst.

While fairly large header pipe diameters are required for larger engines, 1⅝-in. O.D. pipes are fine for small engines. The idea here is to keep the exhaust gas velocities, and consequently the inertia of the gases, at a high level for the best cylinder scavenging and intake charge inducement. The characteristics of individual engines may well require variations in pipe length but if at all possible, the engine speed at which maximum induction ram effect occurs should coincide with that produced by the exhaust system.

CLUTCH AND FLYWHEEL ASSEMBLY

The stock Chev pressure plate assembly is automatically vetoed for use with a modified engine. It can, however, be reworked with heavier springs and will perform quite satisfactorily. The only problem, and a serious one too, is that stock pressure plates distort, crack and eventually explode under heavy spring loadings, and the same can be said of stock flywheels. The two best bets are a flywheel of either steel or aluminum and either an aluminum or a semi-steel pressure plate. The decision to use either the lighter aluminum or heavier steel and semi-steel assemblies must be worked out with the chassis requirements. Sometimes, and particularly with a heavier car, the higher inertia of the heavier flywheel and pressure plate can be used to very definite advantage. Or perhaps the combination of a steel flywheel and aluminum pressure plate will work most favorably.

The choice between the straight spring-loaded Borg and Beck pressure plate and the semi-centrifugal Long-Ford type is a tossup. The former give equal bite at any engine speed but require relatively heavy spring loads to contain engine torque and, consequently, have rather high pedal pressures, which is no real problem with a hydraulic clutch release cylinder. Correctly adjusted, this type of pressure plate has no clutch engagement or release problems. The semi-centrifugal Long-Ford type assemblies are sometimes plagued by not releasing properly at high engine speeds. But this is merely a matter of adjustment. Occasionally, these units slip at lower engine speeds because insufficient engine speed has not permitted the centrifugal weights to extend themselves fully and thus augment the spring pressure. It's about time that someone in this country developed a simple, inexpensive, explosion-proof, multiple-disc clutch assembly that would fit in existing spaces.

There are two basic types of clutch disc: those with spring-loaded hubs and spring-cushioned disc faces and those with solid hubs and solid disc faces. The spring-loaded and cushioned varieties are found in passenger cars and are the most satisfactory for general use. The solid type disc is primarily for competition and is a real bother in traffic. Release of the clutch is usually accompanied by some chatter and a very decisive final engagement. This type can be quite difficult on gearboxes, driveshafts, U-joints, axle shafts and the like, particularly when starting from a standstill.

The flywheel and pressure plate assembly must be magnafluxed or x-rayed and must be balanced as a unit. It's necessary that this assembly be reinspected at quite frequent intervals for distortion, cracks, heat checks, etc. It's a good plan to allow for the admission and expulsion of air in the bell housing to attempt to minimize clutch problems generated by heat.

FINAL TUNING

When one becomes familiar with the engine and its requirements under varying conditions, final fine tuning can be effected in short order. Plugs, carburetion and ignition timing are the three variables that can combine to make a sharp engine out of a dull one, assuming the gear ratio is correct for the race course. Short, twisting, relatively slow courses place emphasis on good mid-range performance rather than sheer top end power. For these events,

the air/fuel mixture ratio should be just a bit on the lean side for sharp throttle response but not so lean as to encourage detonation. An air/fuel mixture ratio of from 12.7 to 12.8 to 1 at full power, full load is about right for short courses. In no case should the mixture be leaned out more than 13 to 1. At the same time, a steady speed cruising mixture ratio of 15 to 1 is advisable. When this has been obtained, the richer mixtures required for maximum power can be regulated by changes in the power system rather than the main metering jets. This applies to conventional American type carburetors, not to Webers, Solexs or the Hilborn injector. Weber and Solex carburetors have no power system as such, so the mixture must be regulated by the main metering jets, the emulsion tubes and the air correction jets. Satisfactory mixture ratios with the Hilborn can only be obtained when the engine is under full load from about 4000 RPM on up.

The slightly leaner mixtures for short course work should be accompanied by an increase in spark advance. If the ignition has been set up as described and the exact amount of total ignition advance is known, this becomes merely a matter of adjusting the initial spark advance with a timing light. Don't get carried away here; adjust the ignition in increments of two crankshaft degrees, taking care to observe a 45-crank-degree maximum limit.

For fast courses where maximum power is used for an appreciable length of time, a full throttle mixture ratio of 12.5 to 1 is definitely recommended. Again, the steady speed cruising mixture should be close to 15 to 1. For these conditions, knock the spark advance back to a maximum of 40 to 42-crank-degrees. Richer mixtures are slightly more prone to detonate under high compression ratios.

There exists strong general tendencies to overgear a car for racing. Performance under such a condition can hardly be sparkling, no matter how good the engine and chassis may be. A road race machine, a drag strip car or a daily transportation type of chug all perform better if the rear axle gear ratio is fairly low (numerically high). Racing sports cars should be geared for the best performance going into and emerging from turns because this is where the car will spend the majority of time on the course. Sometimes, but not always, this may require lifting the throttle foot a bit in order to observe maximum engine speed limits on the straights. It must be remembered that, while a lower gear improves acceleration, it also improves the ability of the car to slow down when the engine is "on compression" with a closed throttle. 'Nuf said?

While we expect a racing engine to perform, we can't expect it to last forever. A modified Chev engine should be completely disassembled and thoroughly inspected after every 400 to 500 racing miles. All parts that look doubtful should be replaced without question. Rod and main bearings and piston rings should be renewed at each teardown. An occasional magnaflux and x-ray inspection of major components is definitely advisable. Piston, combustion chambers and valves must be cleaned and thoroughly inspected for

(Continued on page 92)

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(Continued from page 91)

cracks, overheating and for signs of detonation. Lap the valves in to make sure they are seating and sealing properly. Look for wear and tear in the more unlikely places too, like the rocker arms and valve stem tips. Inspect for bent or worn pushrods, cracked or galled lifter faces and cam lobes. Measure the valve spring pressures. Clean and inspect the ignition and induction systems. Examine the oil pump and the pump drive shaft. Even inspect the oil pan for cracks and leaks. In short, check everything and be very thorough about it.

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" "	3⅞	3	283
" "	3⅞	3¼	306
" "	3⅞	3⅜	318
" "	3⅞	3½	330
'57 - '59	3⅞ (stock)	3 (stock)	283
" "	3⅞ + .060	3	292
" "	4	3	301
" "	4	3¼	324
" "	4	3¾	339
" "	4	3½	351

Alfa Spider Sedan

(Continued from page 57)

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SPECIFICATIONS

POWER UNIT:

Type (or name)	In-line water-cooled four
Valve Operation	Chain driven dual overhead camshafts
Bore & Stroke	3.33 x 3.46 in (84.5 x 88 mm)
Stroke/Bore Ratio	1.04/1
Displacement	120.4 cu in (1975 cc)
Compression Ratio	8.25/1
Carburetion by	(roadster)—Two Solex twin-choke side draft (sedan)—One Solex twin choke down draft
Max. Power	105 bhp @ 5300 rpm
Max. Torque	112 lbs-ft @ 3500 rpm
Idle Speed	750 rpm

DRIVE TRAIN:

Transmission ratios	overall ratios
I	3.26 (15.60)
II	1.98 (9.48)
III	1.36 (6.50)
IV	1.00 (4.78)
V	0.85 (4.07)
Final drive ratio	4.78 (5.12, 4.55 optional)
Axle torque taken by radius arms and A-frame	

CHASSIS:

Wheelbase	107 in
Tread, front and rear	55,54 in
Front Suspension	Independent, coil springs and wishbones, anti-roll bar
Rear Suspension	Rigid axle, coil springs, lower radius arms and centrally located upper A-frame
Shock absorbers	Telescopic
Steering type	Worm and sector
Steering wheel turns L to L	3¼
Turning diameter, curb to curb	34 ft
Brakes	Girling two leading shoe front, finned aluminum drums
Brake lining area	264 sq in
Tire size	165 x 400

GENERAL:

	(sedan)	(roadster)
Length	186 in	177
Width	67 in	65
Height	57 in	52
Weight, curb	2880 lbs	
Weight, as tested	3185 lbs	
Weight distribution, F/R as tested	51/49	
Fuel capacity	15.8 U.S. Gallons	

RATING FACTORS:

	(sedan)	(roadster)
Specific Power Output	0.87 bhp/cu in	0.96
Power to Weight Ratio	27.5 lbs/hp	
Piston speed @ 60 mph	1840 ft/min	
Braking Area	183 sq in/ton	
Speed @ 1000 rpm in top gear (V)	18.8 mph	

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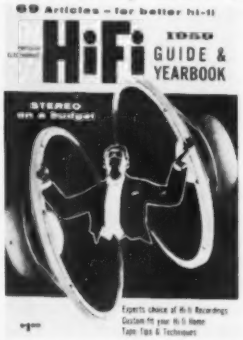

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Brooklands 500

(Continued from page 69)

Denly, who had been leading on George Eyston's supercharged Midget, retired with a broken piston after three and a half hours, letting Horton through to first place. With the added responsibility of seeing Horton maintain his lead position, his Jack of all trades became more harrassed and overwhelmed than ever, but not for long. Eyston, with nothing left to occupy him at his own pit, moved in on Horton's, complete with full personnel, a man for every chore.

Thus, under the management of an eliminated rival, Horton and codriver Bartlett went on win at 96.29 mph average — a fraction of a mile slower than the previous year's Indianapolis winning speed. This Midget, remember, was a seven-fifty.

The 1932 event produced one of the few really close and thrilling finishes in 500 annals. The novelty of such excitement evidently was too much for the public address announcer, who, when the final decision hung by a hair, identified the leader as a car that actually had never even started.

Indispensable as it was, for reasons already explained, the handicap factor was also the 500's worst enemy in the sense that it made the whole thing too difficult for the inexpert to follow. At any given stage of a handicap race, of course, except occasionally for a brief spell near the end, there are *two* leaders, one by virtue of actual distance covered, the other in terms of comparison between his theoretical and realised speeds. But all this sounded like so much doubletalk to anyone but sea lawyers. Female spectators in particular, I used to find, were liable to gaze glazedly into space after the first half-hour or so, resigned to incomprehension of the fact that although an Austin 7 was scoreboarded as having covered thirty more laps than the Napier Railton, the latter was leading and the former was nowhere.

But if the 500, for fifty-nine minutes per hour on the average, easily maintained its place as the dullest race on the British calendar, it was intermittently galvanised

(Continued on page 94)

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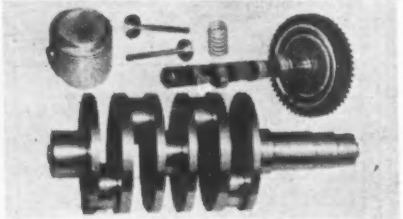

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Brooklands 500

(Continued from page 93)

by drama. And tragedy too, alas. Worst of its disasters was the crash that killed Clive Dunfee in 1932. Second in partnership with Sammy Davis in '29, then co-winner in 1931 with Cyril Paul, Clive was paired the following year with his brother Jack at the wheel of the fastest and hairiest car seen to date in the 500. This was the celebrated Old Number One Bentley, but refitted for the BRDC date with an 8 litre engine. In trying to pass another car at the top of the Home Banking, Clive put the Bentley into a gap that was less than a Bentley wide, ran his offside wheels over the edge, and lost control. Old No. 1 was catapulted into space, tearing down half a dozen of the trees that fringed the banking. Dunfree was thrown out onto the concrete. Some idea of the steepness of the Brooklands turns can be gathered from the fact that to reach Dunfee's body and retrieve it from the path of oncoming cars, officials on the spot had to be lowered from the top edge with the aid of saplings the Bentley had uprooted.

The following year the 500 claimed another victim when a Midget driven by an unknown called Watson unaccountably looped the loop on the level between the Byfleet and Home Bankings, suffering total destruction by impact and fire.

Although the 500 — these calamities apart — was understandably regarded as something of a joke by cosmopolitans with the advantage of a continental and/or American education in automobile racing, there were others who took it extremely seriously. Those responsible for readying the Austin works team in 1930, for instance put all three cars and their six drivers through full 500 miles rehearsals before the race, including stopwatched and meticulously logged and drilled pit-stops under active-service conditions. Such foresight and preparedness paid off, outright victory rewarding the Seven codriven by Sammy Davis and the Earl of March. (Considering that this baby screamer, powered by a flat-head engine with a two bearing crank, averaged 83.42 mph and was controlled at over 87 for a considerable part of the race, it isn't surprising the two other works Austins found the pace too hot and blew up).

Often, though, 500 pitwork and car control was ham and dilatory in the extreme, exemplified by a 1931 incident. A Talbot, driven by Lewis and Saunders-Davis, was beating its handicap and leading the race when they brought it in for a due wheel-change. It then developed that the best the pit could muster in the way of hoisting equipment was a pair of small screw type jacks issued with the standard toolkit. The stop took 3 mins. 7 secs. and Lewis wasn't leading anymore when he finally resumed motoring. The Talbot placed second.

There were even examples of drivers failing to memorise the whereabouts of their own pits and the look of their own signallers, an omission which in 1934 had the curious result that a fellow named Ashby inadvertently responded to somebody else's come-in signal and paid a call on a pit with which he wasn't even on speaking terms.

By virtue of a win for a 750 — the Davis/March Austin — in 1930, the Brooklands 500 temporarily surrendered the title of the world's fastest long distance race to Indianapolis; but the Dunfee and Paul victory in 1931 on the Speed Six Bentley, at 118.39, turned the tables again; highest Indy speed at that time was still the six years old record set by de Paolo and Batten in '25, at the close of the 2-litre era.

The Class H resurgence in 1932, when Horton's Midget won at 96.29 mph, once more tipped the balance in favor of Indianapolis, where that year's speed had been a local all-time fastest at 104.14. Subsequently, Brooklands didn't get the blue ribbon back until 1935, when John Cobb, partnered by one of his Bonneville co-drivers, Tim Rose-Richards, whistled and swished around to make it 121.28 for the prescribed 181 laps of Britain's 2.767-mile track. Handicapped by a tightened-up fuel consumption formula, the 1936 Indy winner fell more than seven miles short of Fred Dixon's successful 2-litre Riley at Brooklands in 1936: unblown, this remarkable car, built and tuned by its remarkable owner, did 116.86.

And that was the last Brooklands 500 ranking in distance with the Indianapolis prototype. For 1937, to allay the ennui that seemed inseparable from the traditional race length, and also in the hope of drumming up a bigger field, the BRDC reduced the sentence to 500 kilometers, or about 312 miles. By this dodge they were still able to call it the Five-Hundred. Comparisons between the U.S. and U.K. marathons under these out-of-step conditions are of course invalid, but for the record, John Cobb and Oliver Bertram averaged 127.05 in 1937 on the former's 24-litre Napier Railton.

Technically, and as a piece of trackmanship, Dixon's 116.86 mph average on two unblown litres was the outstanding performance of the whole series. That time, in 1936, he used a codriver, but on the occasion of his previous win, two years earlier, he'd done all his own chauffeuring, turning 104.80 in nonstop pelting rain.

In Britain, of course, we never did and still don't postpone races on account of rain, partly because any alternative date we dared pick on would probably turn out wetter still. But the 1934 Five-Hundred was so aquatic that John Cobb, not a man who minded getting his feet wet in ordinary circumstances, decided that on concrete that was literally awash the Napier Railton's 900 horsepower was a hindrance rather than a help; so he sensibly quit after a few hundred miles.

Of the several wrecks that punctuated this water-logged race, one was notable for an extraordinary coincidence. The late Walter Handley, driving Gearge Eyston's Magic Magnette, went into what started as a fairly routine spin at 120 — and finished with the MG pinpointing and demolishing its own signalling station alongside the Railway Straight. Multiply the lap distance by two — to arrive at the length of the infield plus outfield boundaries — and you realise that Handley had 5.535 miles in which to make his exit; but no, he had to pick that exact spot. Luckily, his signals man saw him coming.

(Continued on page 95)

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From memory and research, I have the impression that no American driver/car combination ever actually contested the BRDC 500, but it seems that such a combination set the fastest lap ever logged under BRDC auspices. This was Whitney Straight's 140 mph go-around on his 4.3 litre Duesenberg, unofficially timed but probably authentic, during training for the 1934 race. The best Straight ever did against official clocks was 138 and some, making a class C lap record that was never beaten.

While it's true, as I have said, that close finishes were the exception in the 500, this wasn't a reflection on the standard of handicapping, because even a human comptometer couldn't legislate for delays due to mechanical frailty. Sometimes, in fact, the handicapping was incredibly accurate. In '35, to take one instance, John Cobb's theoretical capability was 121.47 mph — and he actually averaged 121.28, a 23 seconds error in 500 miles. In an earlier age the authors of this uncanny calculation would have been burned at the stake.

The Brooklands surface, although reasonably smooth over much of its area, possessed local black-spots that never would have been tolerated at Indianapolis or Montlhéry. Typical of the havoc caused by these sections was the puncturing of the fuel tank of Earl Howe's Bugatti by its own back axle in one 500. The series abounded in feeler-gauge escapes resulting from drivers either hitting or just missing bits of car shed on the track by other people. Sammy Davis might not have survived to win for Austin in 1930 if he hadn't exercised exquisite legerdemain in avoiding a back wheel, complete with half-shaft, that had come asunder from Clive Dunfee's Bentley a couple of seconds earlier. A Midget driver in the same race was tailing John Cobb's GP Delage when the French car's three-piece front axle reverted to its three component pieces . . . and what an avoidance *that* was. In '32, somebody's fuel filter neck broke off and fell onto the fairway, to be struck by Norman Black's Midget; the impact exploded a tire and the MG spun five times, berserk as a rabid baboon.

The BRDC, it used to be said, chose an end-of-season date for the 500 so competitors would have all winter before them for rebuilding their stricken machinery. "In few other races", soliloquised the *Motor*, "do cars break to pieces with quite such regularity". And never was the toll heavier than in the tire-pulverising 500 of 1935. Cause of the debacle was the break-up of a section of the Home Banking, starting with a couple of long but shallow indentations, then developing gradually into jagged edged troughs that were quick death to racing rubber. . . .

"As each tire stabbed the hole", reported the *Motor*, "a fresh gout of debris would spurt up, to roll in a cascade of stones down the slope, until the slower cars had to pass over a miniature beach".

John Cobb, playing it canny, pulled the three-ton Napier Railton down below the craters each time around, but if he saved a set or two of tires this way he didn't manage to stay out of trouble altogether; a flying fragment, thrown up by a car John was shaping to overtake at 130,

(Continued on page 98)

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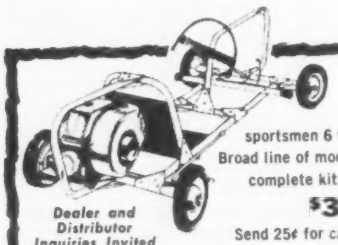

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Lancia Appia

(Continued from page 59)

knob to reduce the possibility of barking an elbow while maneuvering — a typically thoughtful touch.

To start from cold you pull back a mixture-control lever that chokes the single-throat Solex carb. You press the ignition key to activate the starter and it may take two or three tries to light the little V4 engine. When it fires in the presence of strangers you can count on surprised expressions. These are caused by the near-total silence and by the faint, turbine-like hum which the engine emits.

The four-speed transmission does not have a synchronized first gear but first is engaged easily without clashing if the operation is not rushed. The ratio is quite low and the car jumps forward with lively acceleration and a soft gear whine. The other three gears are silent and their synchronization is faultless. The transmission and column shift do exactly what they were intended to do and do it smoothly and without a trace of balking.

The spacing of the ratios makes it easy to stay abreast of brisk city traffic and, much of the time, ahead of it. Third is an extremely useful gear and is ideal for nearly full-time use in traffic, providing both good acceleration and good engine braking. The downshift from fourth to third is as smooth and easy as flapping a turn indicator and it's a pleasure always to use this gear in any braking operation.

The factory manual for the Appia recommends use of third up to 50 mph although fourth pulls strongly from much lower speeds. In third the car will wind out to 55 mph with ease . . . and much faster than that if you want to approach valve float.

In top gear the Appia is happily at home cruising in the 70's. It does this as smoothly as the proverbial sewing machine and with as little sound. In fact, the engine barely can be heard above the rush of air past the car's body. The manual specifies a top speed for the Appia of 80 mph. We achieved this with a one-mile approach to the quarter-mile timing trap but the car still was accelerating gently and our electronic tachometer indicated about 4800 rpm, at which the engine develops its hp peak. But we had topped 6000 in the indirect gears and the engine wants to wind beyond 4800 in fourth. The Appia's speedometer, incidentally, is one of the most accurate ones that we have encountered.

Steering is by worm and sector gears. With the car in motion it is finger-light and at a standstill could hardly offend the power-steering addict. Except for a very faint feedback of road shock to the wheel the steering is perfect. The Appia steers no differently at 80 than it does at 10 mph.

This car's front suspension is by means of Lancia's venerable and famous solid front axle with sliding pillars and coil springs. Rear suspension is by conventional semi-elliptic leaves. The ride is one of those delightful combinations of firmness without sharpness and the shock absorbers are adjustable to suit individual tastes. The manual calls for 21 psi tire inflation pressure. We found this to produce a mushiness in the corners and increased the pressure of 27 psi all around. The suspension absorbed the increased harshness; the ride was scarcely changed but cornering bite was considerably improved.

The Appia is such a competent and comfortable car that we feel it would be a pleasure to make a round-the-world tour in one. But although it is designed to give complete satisfaction in the mountains and on the fast autostrade of its native environment it is hardly a serious Mille Miglia contender. It is a fine touring vehicle and must be judged as such.

Even with full use of its excellent gearbox the Appia hasn't the torque to get it through turns in a real hurry, assuming that the chassis could handle higher cornering forces. It can be cornered with verve, speed and safety up to quite decent limits but limits that are well below those designed into the Aurelia Gran Turismo, for example. When the Appia reaches its limits in a turn it makes a gradual breakaway on all four wheels, rather than mainly sliding its front or rear end. Its cornering behvior is completely compatible with the car's overall personality. Only one defect was noted. On downhill hairpin bends taken at tight lock, there seems to be a binding in the front end's sliding pillars with a resultant hopping of the front wheels. The conditions that evoke this behavior occur rarely and this is the sole functional shortcoming of any significance that we found in the Appia.

The car's brakes are all that might be expected of a mountain-bred thoroughbred. The ratio of friction area to car weight is high; all brake drums are deeply finned; the front drums, which bear the highest loads, are of light alloy; all shoes are of light alloy. In our punishing ten emergency-stop test from 60 mph the decelerometer registered no trace of fade. The required pedal pressure is light.

Light weight helps the Appia's braking, acceleration, speed and feel economy. In spite of its feel of great solidity our test car weighed in at 2100 lbs., soaking wet and carrying test gear. The extensive use of aluminum, including the hood and all four doors, contributes to this. But the car is not small. It is designed to carry four adults in real comfort but will handle six. Its trunk is of generous size; the glove compartment is tiny but there are large pockets in each of the four doors, plus roomy receptacles for incidentals at each side of the body beneath the instrument panel. There's also a useful parcel shelf behind the rear seat.

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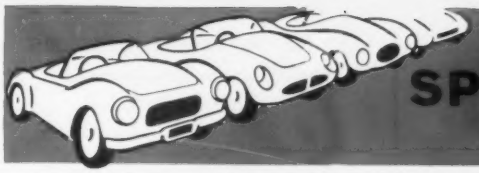
—*gb*



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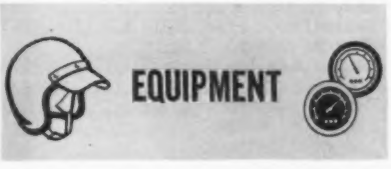

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Driving The MG Twin Cam

(Continued from page 79)

a bit to the right between there and point #9. I consider that I am in perfect position at point #10 if the left front wheel is about six-feet from the left side of the road and the car is pointed dead ahead, into the short straight that separates the two sections of the Esses.

And that, my friends, is the lesson for today. It *won't* make a race driver out of you overnight, but if you are really serious about going into competition you should begin to see, from the above description, that it is a complicated business—oops, sport—one that requires a great deal of practice and experience. Before you go out to race, you should be certain that you are complete master of your car, and have confidence in your ability to handle any situation.

—da

Brooklands 500

(Continued from page 95)

caught him full in the face. With the phlegm for which he was famous, Cobb never ducked or swerved. Assisted by co-driver Rose-Ricards (who alternately gallumphed clear over the gashes or rode a high line between them and the top of the banking), he went on to win this, the fastest of the full 500-milers, at 121.28 mph.

Cobb, the reluctant hero, to whom plaudits and back-slapping were genuinely a pain, was spared the ordeal of popular acclaim when he lifted his foot off the majestic Napier Railton's throttle at the finish of the final, fore-shortened 500 on September 18th, 1937. He and his codriver, lawyer Oliver Bertram, had led without let or hindrance from beginning to end. But the end, true to the character of a race with a genius for anticlimax, took most of the audience unawares. "Cobb finished without any spectacular demonstration whatever", as one account put it. "The public did not even know the race was over. The scoreboards were not informative and the loudspeakers were inclined to be secretive". Whisper it not in Gath, the BRDC Five-Hundred had died on its feet.

—Dennis May.

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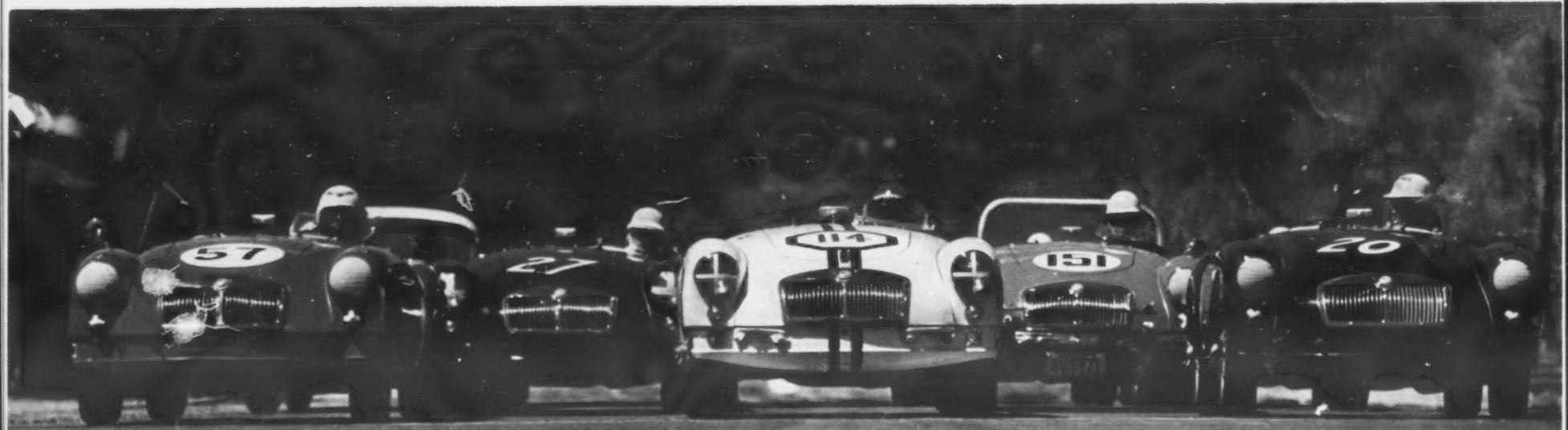

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